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ABSTRACT

Data are reported from the third individual interview conducted in 1979 as part of a 3-year study on addition and subtraction using verbal problem solving. From three schools in Wisconsin that used the Developing Mathematical Processes program, 150 first-grade children were individually administered six problem types (two solvable by addition and four solvable by subtraction) given under four conditions involving size of numbers and presence of manipulative materials. Answers were coded by model, correctness, and strategy. Individual student profiles are discussed first, followed by a summary of pupil response data. Several important aspects of the summary data are isolated for contrast and comment. Finally, some secondary analyses of combined data are given. Appendices contain sample problem tasks and individual student profiles. (MNS)

Working Paper No. 289

Results From Third Individual Interview (May 1979), Coordinated Study #1

by

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MISSION STATEMENT

The mission of the Wisconsin Research and Development Center is to improve the quality of education by addressing the full range of issues and problems related to individualized schooling. Teaching, learning, and the problems of individualization are given concurrent attention in the Center's efforts to discover processes and develop strategies and materials for use in the schools. The Center pursues its mission by

- conducting and synthesizing research to clarify the processes of school-age children's learning and development
- conducting and synthesizing research to clarify effective approaches to teaching students basic skills and concepts
- developing and demonstrating improved instructional strategies, processes, and materials for students, teachers, and school administrators
- providing assistance to educators which helps transfer the outcomes of research and development to improved practice in local schools and teacher education institutions

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WISCONSIN RESEARCH AND DEVELOPMENT
CENTER FOR INDIVIDUALIZED SCHOOLING

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A major aim of mathematical instruction is to enable students to acquire concepts and skills requisite for solving problems of many types. A principle goal of mathematical education research is to understand how children acquire those concepts and skills and to understand how selected pedagogical and psychological factors are related to their acquisition. The Mathematics Work Group of the Wisconsin Research and Development Center for Individualized Schooling is presently conducting a program of research focused on a small set of those concepts and skills. Our interest lies in arithmetical learning, and in particular, in the acquisition of concepts and skills related to addition and subtraction of whole numbers.

The research program is attempting to relate pupil performance on selected arithmetic skills to pupil cognitive processes, instructional materials, and teachers; classroom behaviors. The interrelationship of these variables is depicted in Figure 1. Using this framework, we are proceeding to:

1. identify important addition and subtraction skills;
2. review past empirical data or collect new data on these skills;
3. re-examine these mathematical skills and hypothesize how they are related to underlying cognitive skills;
4. examine the instructional materials designed to teach these skills; and
5. conduct a series of empirical studies on the appropriateness of particular teacher classroom behaviors, the appropriateness of instructional materials, and the relationship of specific cognitive skills to

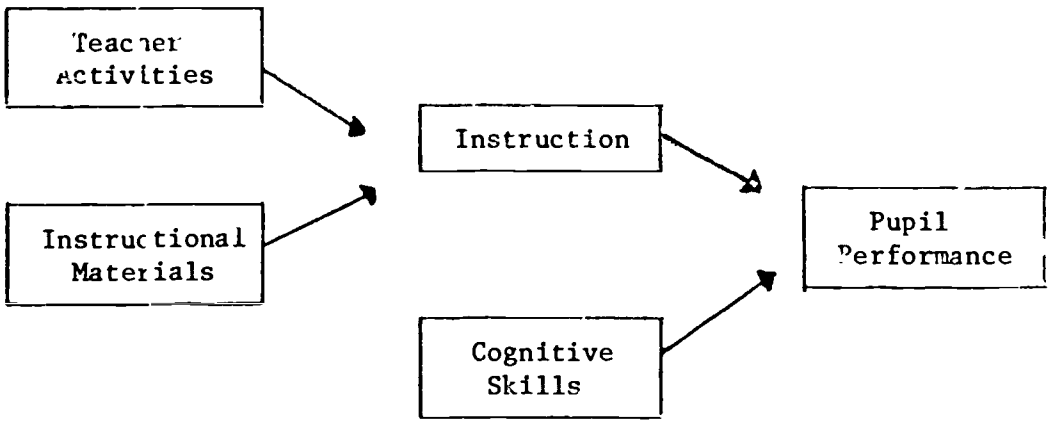

Figure 1. Factors influencing pupil performance.

mathematical skills.

The work of the Mathematics Work Group is built around the conceptual framework exemplified in Figure 1. The empirical and theoretical investigations generally involve two or more of the factors depicted, and have been organized into four major categories. These are a conceptual paper series, a set of short empirical studies, a major longitudinal study, and an invitational conference of scholars.

This paper relates to the longitudinal study. Approximately 150 students in three separate schools have been identified as subjects for the study and are being followed for about three years. Pupil performance will be measured in several ways:

1. Individual interviews. At several times during each school year, individual children are administered a set of problem tasks dealing with addition and subtraction. The interviewer attempts to ascertain the children's solution strategy, correctness of answer, type of errors made, and modeling procedures.

2. Group administered paper-and-pencil tests. There are two separate categories of tests:

   a. Achievement monitoring. These tests measure pupil progress toward a set of performance objectives that are contained in the instructional materials. By means of matrix sampling procedures, estimates are made of group performance. Achievement monitoring tests are given shortly after the completion of the instructional units related to arithmetic objectives.

   b. Topic inventories. These are very short tests that measure

pupil progress toward mastery of the objectives of a specific instructional unit, or topic. Every subject takes the same test, resulting in a measure of individual performance.

Instruction and classroom environment are assessed by direct classroom observation of teacher actions, pupil behaviors, and instructional materials. A trained observer is present each day the instructional units, or topics, dealing with arithmetic objectives are being used. Organizational and grouping measures are noted, along with indications of interactions between teacher and pupils, and among pupils. Measures of pupil engaged time are estimated by observing six target students.

The purpose of this paper is to report on the data from the third round of individual interviews for Coordinated Study #1, which were carried out during May 1979. In the first major section we present all the background information on subjects and the manner of data collection. In the following two major sections, summaries and interpretations of the data are given. Some of the actual data collected in the interviews appears in the Appendices.

Background Information

This section contains background information needed to understand the data summaries given in the next section. As indicated in the various subsections, greater detail may be obtained by referring to other reports from the Mathematics Work Group.

Population and Curriculum Materials

The third interview of individual children was carried out during the period May 14-18, 1979, at the three participating schools:

School 1: a public school in Monona, Wisconsin.

School 2: a public school in Madison, Wisconsin.

School 3: a parochial school in Madison, Wisconsin.

The subjects for the study consisted of 150 first grade students, all from predominantly middle class areas, who had parental permission to participate in the interviews. Table 1 presents the number of children who participated in the study in each school and information about their age when the interview was given.

Each of the schools used as their mathematics curriculum the Developing Mathematical Processes (DMP) program (Romberg, Harvey, Moser, and Montgomery, 1974). The following sequence of topics was suggested to the eight teachers involved in the study: 15, 17, 19, 20, 21/23, 24, S-1, 26, S-2, 22, S-3, 28. Most teachers also did Topics 16 and 18. Topics S-1, S-2, and S-3 were specially prepared for Coordinated Study #1 (see Kouba and Moser, Note 1).

The interviews were begun following instruction in Topic S-3. By this time in their mathematics instruction, the children had been introduced to writing and solving addition and subtraction sentences 0-10.

Interview Tasks

The interview consisted of six problem types (tasks) given under four conditions. The four conditions are described later. The six types included two problems solvable by addition of the two given numbers and four problems solvable by subtraction of the two given numbers. The characterization for these six problem types is detailed in Moser (Note 2) and in Carpenter and Moser (Note 3).

Table 2 presents representative problems and the order in which the

Table 1

Number and Age of Population by School

	School 1	School 2	School 3	Total
Number of children	67	48	35	150
Mean age	7 yr. 1 mo.	7 yr. 1 mo.	7 yr. 3 mo.	7 yr. 1 mo.
Maximum age	7 yr. 10 mo.	7 yr. 9 mo.	7 yr. 10 mo.	7 yr. 10 mo.
Minimum age	6 yr. 5 mo.	6 yr. 6 mo.	6 yr. 7 mo.	6 yr. 5 mo.
Male	37	25	24	86
Female	30	23	11	64

problems were administered to the children. The actual wording for each problem type differed in the four conditions, but the semantic structure remained constant. The actual problems administered are given in Appendix A.

Within each problem, two of three numbers from a number triple (x, y, z) defined by $x + y = z$, $x < y < z$, were given. In the two addition problems x, y were presented, with the smaller number x always given first. In the four subtraction problems, z and the larger addend y were presented. The order of presentation of y and z varied among problem types.

The six problem types were presented under four conditions that result from crossing smaller numbers vs. larger numbers with presence vs. absence of manipulative materials. Figure 2 shows these four conditions with the labels assigned to them. In the b+ and c+ conditions approximately 30 small plastic cubes about equally divided between blue cubes and orange cubes were available to the child to use as manipulatives if desired.

The actual number triples used in the problems are listed in Table 3. We hypothesized before the interviews began that the four conditions would constitute different levels of difficulty with the b+ condition proving the easiest and the c- the most difficult. The ordering of difficulty of b- and c+ was left to the empirical results. The four conditions became known as the four levels, and that terminology will be used in the remainder of this paper.

The assignment of the number triples (small and large domains) to problem types involved a six-by-six Latin square design resulting in six sets of the six problem types. These sets were uniformly and randomly distributed across subjects. The Latin squares for the small number domain (b) and the large

Table 2

Respresentative Problem Types

Task 1.	Joining (Additi)	Kay had 3 flowers. Her sister gave her 5 more flowers. How many flowers did Kay have altogether?
Task 2.	Separating (Subtraction)	Helen had 11 turtles. She gave 7 turtles to Aaron. How many turtles did Helen have left?
Task 3.	Part-Part-Whole Missing Addend (Subtraction)	6 children are playing ball. 4 are boys and the rest are girls. How many girls are playing ball?
Task 4.	Part-Part-Whole (Addition)	6 big dogs are in the yard. There are also 9 small dogs in the yard. How many dogs are in the yard?
Task 5.	Comparison(Subtraction)	Doug has 3 fishing poles. His sister Ruth has 5 fishing poles. How many more fishing poles does Ruth have than Doug?
Task 6.	Joining Missing Addend (Subtraction)	Warren has 5 stones. How many more stones does he have to put with them to have 7 stones altogether?

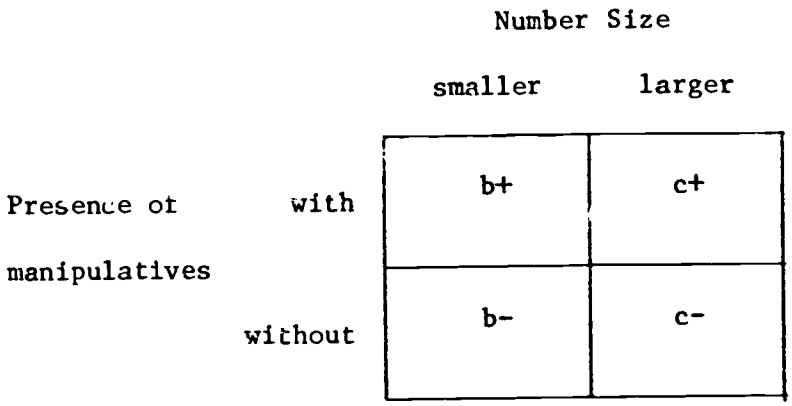

Figure 2. Conditions for nonsymbolic problem types.

Table 3

Listing of Number Triples Used in Verbal Problems

Smaller numbers	Larger numbers
2-3-5	3-8-11
2-4-6	4-7-11
2-5-7	5-7-12
3-4-7	4-9-13
2-6-8	6-8-14
3-6-9	6-9-15

number domain (c) are presented in Tables 4 and 5 respectively. The number in the box (□) in each entry represents the solution the children were to find. The order of the other two given numbers in the tables corresponds to the order in which those numbers appeared in the problem (cf. Table 2). The assignment of problem sets to subjects is listed in Appendix C.

Task sets for a particular level were assigned to children so that the same number triple did not occur in the same problem type (task) in any subsequent interview.

Interview Method

Trained interviewers (see Martin & Moser, Note 4, for details of interviewer training and reliability) administered the interviews. The entire interview process for all schools took one week, the 14th to 18th of May, 1979. Two or three interviewers worked at a given school on each day. Interviews began soon after school started and continued through the day, with the usual breaks at lunch and recess. Table 6 details the assignment of interviewers to schools.

Each interviewer was able to conduct 8 to 18 interviews in a day, depending on the schools' schedules and on the task level. (Level c tasks took longer than level b tasks.) At the schools the interviewers were assigned interview areas, which, for the most part, were quiet rooms separate from distracting activities.

The interviewers went to the classroom to get a child, and they visited together on the way to the interview area. The verbal tasks were reread to the child as often as necessary so that remembering the given numbers or relationships caused no difficulty.

Table 4

b+ and b- Number Triples

Set number	Task 1	2	3	4	5	6
1	3,6,[9]	7,5,[2]	5,3,[2]	2,4,[6]	4,7,[3]	6,8,[2]
2	2,6,[8]	7,4,[3]	6,4,[2]	3,6,[9]	3,5,[2]	5,7,[2]
3	2,5,[7]	8,3,[5]	9,6,[3]	3,4,[7]	4,6,[2]	3,5,[2]
4	3,4,[7]	6,4,[2]	8,6,[2]	2,3,[5]	5,7,[2]	6,9,[3]
5	2,4,[6]	5,3,[2]	7,5,[2]	2,6,[8]	6,9,[3]	4,7,[3]
6	2,3,[5]	9,6,[3]	7,4,[3]	2,5,[7]	6,8,[2]	4,6,[2]

Table 5

c+ and c- Number Triples

Set number	Task 1	2	3	4	5	6
1	6,9,[15]	13,9,[4]	11,8,[3]	4,7,[11]	7,12,[5]	8,14,[6]
2	6,8,[14]	12,7,[5]	11,7,[4]	6,9,[15]	8,11,[3]	9,13,[4]
3	4,9,[13]	14,8,[6]	15,9,[6]	5,7,[12]	7,11,[4]	8,11,[3]
4	5,7,[12]	11,7,[4]	14,8,[6]	3,8,[11]	9,13,[4]	9,15,[6]
5	4,7,[11]	11,8,[3]	13,9,[4]	6,8,[14]	9,15,[6]	7,12,[5]
6	3,8,[11]	15,9,[6]	12,7,[5]	4,9,[13]	8,14,[6]	7,11,[4]

Table 6

Interviewer School Assignment

Interviewer code #	Date 5/14	5/15	5/16	5/17	5/18
12	School 1	School 1	School 1	School 1	
27	School 1				
30	School 2	School 3	School 2	School 3	School 2
32	School 1				
34		School 1	School 1	School 3	
38	School 2	School 3	School 2	School 3	School 3
41	School 2	School 2		School 1	School 2
45	School 1		School 2		
47		School 1	School 2		
58	School 1	School 3	School 2		School 3

An individual interview required two sessions, one for b+ and b-, and the other for c+ and c- tasks. The sessions lasted 10-20 minutes each, with each child receiving the same sequence of problems. No child was interviewed twice in one day.

If a child had extreme difficulty in responding to b+ tasks, the interview was broken off at that level. After each level, the interviewer decided whether the child should proceed to the next level in the sequence b+, b-, c+, c-.

Coding Subject Responses

All of the possible student responses are presented in detail in Cookson and Moser (Note 5). Only a brief description is presented here. The coding sheet upon which responses were recorded is shown in Figure 3.

Model

C The child used cubes to model (all or part of) the problem.

F The child used fingers to model.

N The child used no physical model.

O The child used some other physical mode, such as chairs, numerals on a clock face.

Correctness

Y The answer was correct.

N The answer was not correct.

UN Uncodable: The child gave an answer, but the interviewer was unable to identify the strategy used.

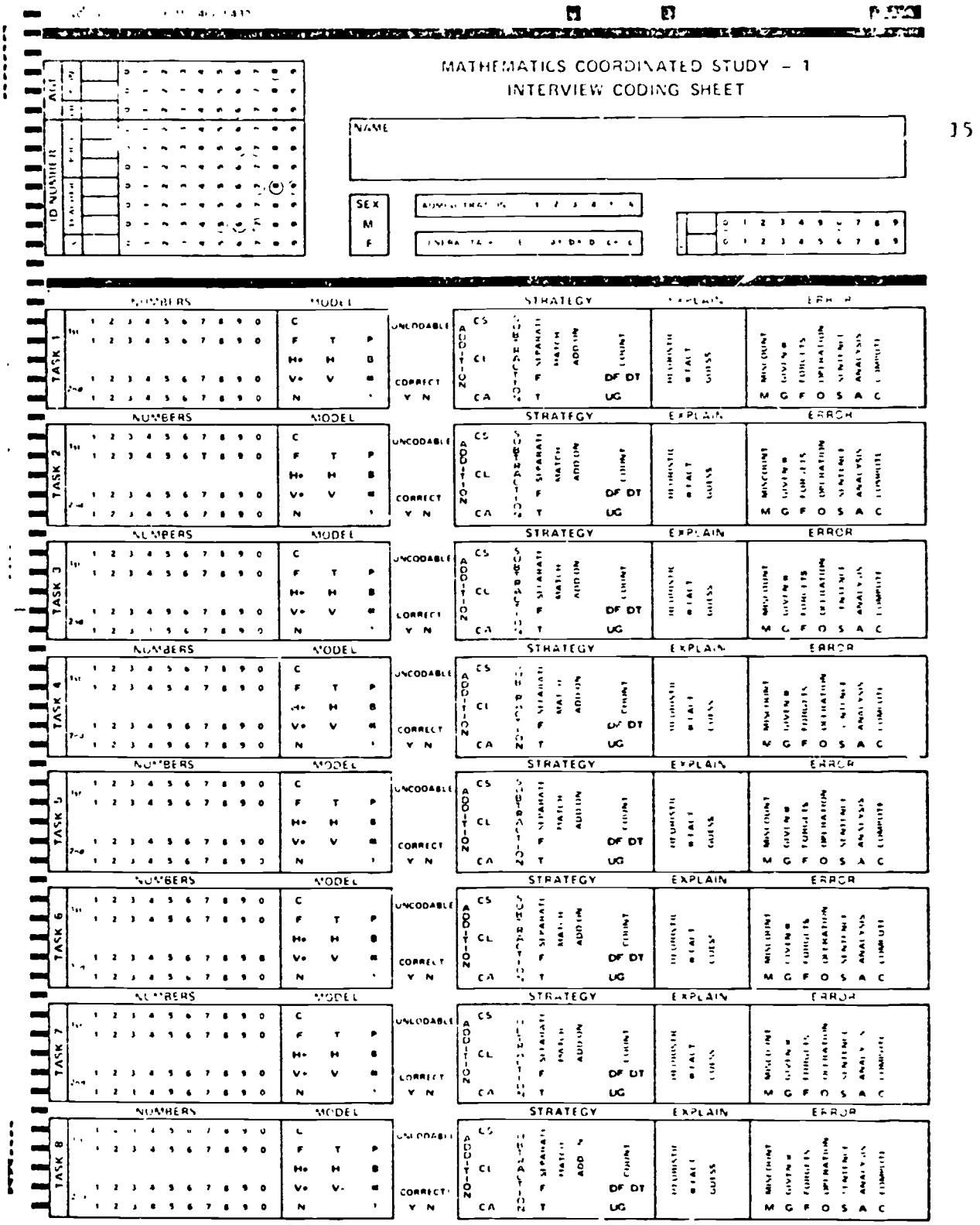

Figure 3. Electronically scored interviewer coding sheet.

Strategy

Addition:

CS Counting On from Smaller or Counting On from First Number: When counting cubes, fingers, or mentally, the counting sequence began either with the smaller number (first number given in the story) or the successor of that number.

CL Counting On from Larger: The counting sequence began with the larger (second) given number or with the successor of that number.

CA Counting All: The child counted the complete union of the sets represented in the problem, with counting sequence started at "one, two, ..."

S Subitizing: The child models the two addends and "recognizes" the sum without counting.

Subtraction:

F Separate From: The child models the larger given set and then takes away or separates, one at a time, a number of cubes or objects equal to the smaller given number in the problem. Counting the remainder set gives the answer.

T Separate To: After the larger set is modeled, the child removes cubes or objects one at a time until the remainder is equal to the second given number in the problem. Counting the number of objects removed gives the answer.

MA Match: The child puts out two sets of cubes or objects, each set standing for one of the given numbers. The sets are then matched one-to-one. Counting the excess of the larger set over the smaller

set gives the answer.

AO Add On: The child sets out a number of cubes or objects equal to the smaller given number (an addend). The child then adds cubes to that set one at a time until the new collection is equal to the larger given number. Counting the number of cubes added on gives the answer.

DF Count Down From: A child initiates a backwards counting sequence beginning with the larger given number. The backwards counting sequence contains as many counting number words as the smaller given number. The last number uttered in the counting sequence is the answer.

DT Count Down To: A child initiates a backwards counting sequence beginning with the larger given number. The sequence ends with the given smaller number. By keeping track of the number of counting words uttered in this sequence, the child determines the answer to be the number of counting words used in the sequence.

UG Count Up from Given: A child initiates a forward counting sequence beginning with the smaller given number. The sequence ends with the larger given number. Again, by keeping track of the number of counting words uttered in sequence, the child determines the answer.

Addition and Subtraction (Explain or Mental Processes):

HU Heuristic: Heuristic strategies were employed to generate solutions from a small set of known basic facts. These strategies usually were based on doubles or numbers whose sum was 10.

#F Number Fact: The child gave a correct answer with the justification

that it was the result of knowing some basic addition/subtraction fact.

GU Guess: The child gave an answer with the justification that it was the result of guessing.

Error:

M Miscount: The child miscounted in some way.

G (GI) Given Number: The child responded that the answer was one of the two numbers given in the problem.

F Forgets: The child forgot one of the given numbers and thereby found an incorrect answer.

O (OP) Operation: The child used an addition strategy in a problem that must be solved through subtraction, or a subtraction strategy was employed in an addition problem.

None of the other items under model, strategy, and error on the coding sheets was used for this interview.

Presentation of the Data

Data were collected on children's behavior following presentation of a specific verbal problem. The six different verbal problem types were presented at four different levels, resulting in a maximum of 24 tasks for an individual child. For reasons to be explained later, not all children received all tasks. Of the 150 children who began the interviews only 133 were administered the complete set of 24 tasks.

This section begins with a discussion of individual student profiles, which comprise the basic raw data, followed by a summary of pupil response data. Several important aspects of the summary data are isolated for contrast and comment. The following major section will present some secondary analyses

of combined data.

Individual Student Profiles

A record of each subject's response to the 24 tasks was compiled from the coding sheets. These profiles are the basis for all other statistical information appearing in this paper. The profiles for all subjects are contained in Appendix B. Figure 4 provides an example of a student profile.

For each task at each level, the four coded entries in order from left to right are model, correctness, strategy, and error. The abbreviations used are explained in the previous section. In the strategy column (as in much of the data analysis for this study) Uncodable (UN), Given Number (GI), and Operation (OP) were treated as strategies.

The hundreds digit of the student ID number identifies which school the student attended: 1, 2, or 3 (see Table 1).

The actual problem and numbers used in the problem for a given level and task can be obtained by using the following procedure. For example, what was the actual problem read to Student 104 for Task 2 at the b- level?

1. Use Appendix A, Problem Tasks by Level, to find the exact wording for Task 2 at the b- level:

> Roger had ____ peanuts
> He gave ____ peanuts to the elephants.
> How many peanuts did Roger have left?

2. Use Appendix C, Number Set Assignment, to find what set was assigned to Student 104 at the b- level. The entry in the b- column for ID #104 is 1.

3. Use Table 4, b+ and b- Number Triples, to find what number triple was assigned to set 1, Task 2. The entry in this table is 7, 5, 2 , where 2 indicates that 2 is the correct solution. Therefore, Student #111 was given the following problem for Task 2, level b-:

Student ID number

104	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y F -	N N OP O	N Y CL -	N Y T -	N Y UG -
b-	N Y CL -	N Y DF -	N ? ? -	N Y CL -	F Y F -	N Y UG -
c+	C Y CA -	C Y F -	N N GI GI	C Y CA -	C Y F -	F Y AO -
c-	N Y CL -	- ? ? -	- ? ? -	N Y CL -	F Y F -	N Y UG -

Level

model
correct
strategy
error

Figure 4. Sample student profile.

Roger had 7 peanuts,
He gave 5 peanuts to the elephants.
How many peanuts did Roger have left?

Looking at Figure 4, we can reconstruct this child's behavior. The first N indicates the child used no modeling. The next entry, Y, indicates the problem was solved correctly. This accounts for the hyphen in the fourth column, indicating no error. The DF in the third column indicates the child used a Counting Down From strategy. This means the child counted backward from 7 five number words to "two" in the counting sequence. The child reported "two" as the answer.

Some general understanding of individual students can be achieved by looking at a profile. For example, when considering Figure 4 for Student 104, one might conclude:

1. The student was confused on subtraction with larger numbers when no cubes were available to model the problem.

2. Task 3 was never interpreted correctly or consistently.

3. The student uses a Counts All strategy when adding with physical objects for larger numbers, but uses a Counts On From Larger for all other addition problems.

A Summary of Behaviors by Task and Level

Each of the four major categories of responses - modeling, correctness, strategy, and error - have been summarized for each of the 24 tasks presented. As indicated in the first major section of this paper, a six-by-six Latin square design was used to distribute the number triples across tasks and across subjects. An initial, informal statistical analysis of the number

triples as a variable affecting subject responses showed that the triples have little effect. The triples 2, 3, 5 and 3, 8, 11 appeared to be somewhat easier than the other triples; however, these were spread uniformly across tasks, so there was little effect on the overall percentages of correct solutions.

Three population subsets. The general goal for the interviews was to present each child with the b+ and b- problems during the first interview session and with the c+ and c- problems during the second session a day or two later. However, not all children were capable of solving all problems. The interviewer had the responsibility to determine at what point a particular level was inappropriate for a child. These guidelines were used:

1. If during the b+ portion of the interview the child fails to use any coherent or identifiable strategies while trying to solve three of the first four problems, terminate the b portion.

2. If the child solves two of the first four b+ problems, but is baffled by the last two problems, i.e., solves two of the six problems, terminate the b portion of the interview.

The interview was terminated, not because three of the four problems were incorrect, but because the child was perpelexed by the problem and employed highly inappropriate strategies or because the interviewer was unable to determine what strategies were being employed.

3. If the child solved at least two of the first four and at least one of the last two of the b+ problems, present the b- problems. The b- portion should be completed unless the child cannot solve three of the first four problems.

4. The decision whether the child should go on to t e c portion was made at the end of the b interview.

The procedure for determining whether to terminate the c+ or c- level interview followed the same guidelines as those given above. The overriding issue was always the well-being of the child. It would have been unfair to interview further any child who was frustrated or unduly confused by the problems. In a few cases, a decision was made to branch only to c+ problems for some children who relied heavily on physical modeling and did well with the b+ problems, but failed to solve b- problems. For these children, then, it was inferred that they could not solve c- problems but that c+ problems might be within their problem solving abilities.

As a result of the policy of terminating the interview before completion for many children, three sets of subjects were identified.

Total population N=150. This is the total interview population and consists of all children who were interviewed, no matter when the interview terminated.

Real population $133 \leq N \leq 150$. This is the number of subjects who actually were administered each task. This number can change for each task or level.

Successful population N=133. This is the number of subjects who were administered all 24 tasks.

The results describe only the Total population, for that is the most representative of the childrens' responses. Although the decisions to terminate interviews resulted in incomplete data for some students, the decision rules were designed so that it is valid to assume that the child would have given incorrect answers or used uncodable strategies on the questions

that were presented. That is, the child consistently had been giving uncodable incorrect answers or was simply confused on all previous problems. Thus, it was a reasonable assumption that subsequent responses would follow the same pattern.

The statistics for the real and the successful population have been compiled and a copy may be obtained by writing the Mathematics Work Group at the R & D Center.

A table for each of the six tasks is presented (Tables 7-12). All four levels for each task are contained in the same table. The uncodable (UN) and confused(?) responses are included in the strategy category. All data are based on the total of 150 subjects.

Levels of Difficulty

Prior to administration of the interviews, it was hypothesized that the four interview conditions, b+, b-, c+, c-, would represent sequential levels of difficulty. The number of students responding correctly to each task under each condition gives general support for this hypothesis. Table 13 shows the ordering of difficulty for all tasks across all levels. By the time of this interview, the differences in difficulty between b+ and b- levels had virtually disappeared except for tasks 3 and 5.

Comparative Difficulty of Addition vs. Subtraction

Results from the third interview are consistent with those of previous interviews and of other research that addition tends to be easier than subtraction. The average number of correct responses per level for the two addition problems was compared to the average number of correct responses for all four subtraction problems. Since two of the subtraction problems, Task 3: Part-Part-Whole, missing addend and Task 5: Comparison, proved to be more difficult

Table 7

Task 1 (Addition-Joining)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	70(47%)	0(0%)	89(59%)	0(0%)
F	Fingers	14(9%)	55(37%)	14(9%)	70(47%)
N	No Action	67(45%)	92(61%)	43(29%)	69(46%)
O	Other	0(0%)	1(1%)	0(0%)	1(1%)
Y	Correct	138(92%)	137(91%)	125(83%)	106(71%)
UN	Uncodable	5(3%)	9(6%)	4(3%)	12(8%)
?	Confusion	0(0%)	0(0%)	0(0%)	1(1%)
CS	Counts On from Smaller	8(5%)	21(14%)	17(11%)	34(23%)
CL	Counts On from Larger	23(15%)	21(14%)	33(22%)	42(28%)
S	Subitizing	6(4%)	5(3%)	0(0%)	1(1%)
CA	Counts All	50(33%)	26(17%)	70(47%)	22(15%)
HU	Heuristic	5(3%)	2(1%)	3(2%)	3(2%)
#F	Number Fact	48(32%)	63(42%)	17(11%)	18(12%)
GU	Guess	4(3%)	1(1%)	1(1%)	4(3%)
GI	Given Number	1(1%)	0(0%)	0(0%)	1(1%)
OP	Wrong Operation	0(0%)	0(0%)	4(3%)	1(1%)
M	Miscount	5(3%)	6(4%)	18(12%)	21(14%)
F	Forgets Data	1(1%)	0(0%)	0(0%)	5(3%)
	Not administered	0(0%)	2(1%)	5(3%)	11(7%)

Table 8

Task 2 (Subtraction-Separate)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	76(51%)	0(0%)	97(65%)	0(0%)
F	Fingers	14(9%)	74(49%)	13(9%)	64(43%)
N	No Action	61(41%)	72(48%)	36(24%)	65(43%)
O	Other	0(0%)	2(1%)	0(0%)	2(1%)
Y	Correct	134(89%)	129(86%)	111(74%)	68(45%)
UN	Uncodable	9(6%)	15(10%)	6(4%)	14(9%)
?	Confusion	0(0%)	0(0%)	0(0%)	16(11%)
F	Separate from	85(57%)	65(43%)	96(64%)	35(23%)
T	Separate to	0(0%)	0(0%)	0(0%)	0(0%)
MA	Match	0(0%)	0(0%)	0(0%)	0(0%)
AO	Add On	0(0%)	1(1%)	1(1%)	2(1%)
DF	Count Down from	13(9%)	12 9%)	13(9%)	21(14%)
UG	Count Up from Given	0(0%)	9(6%)	9(6%)	12(8%)
DT	Count Down to	0(0%)	3(2%)	1(1%)	4(3%)
HU	Heuristic	7(5%)	3(2%)	8(5%)	8(5%)
#F	Number Fact	32(21%)	37(25%)	6(4%)	15(10%)
GU	Guess	2(1%)	2(1%)	2(1%)	[illegible](4%)
GI	Given Number	1(1%)	0(0%)	2(1%)	4(3%)
OP	Wrong Operation	1(1%)	1(1%)	1(1%)	2(1%)
M	Miscount	9(6%)	5(3%)	20(13%)	27(18%)
F	Forgets Data	2(%)	6(4%)	3(2%)	0(0%)
	Not administered	0(0%)	2(1%)	5(3%)	11(7%)

Table 9

Task 3 (Subtraction-Part-Part-Whole-missing addend)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	81(54%)	0(0%)	95(63%)	0(0%)
F	Fingers	10(7%)	65(43%)	13(9%)	57(38%)
N	No Action	58(39%)	80(53%)	37(25%)	72(48%)
O	Other	0(0%)	1(1%)	0(0%)	3(2%)
Y	Correct	119(79%)	104(69%)	105(70%)	64(43%)
UN	Uncodable	14(9%)	24(16%)	7(5%)	20(13%)
?	Confusion	1(1%)	4(3%)	1(1%)	14(9%)
F	Separate from	72(48%)	47(31%)	83(55%)	26(17%)
T	Separate to	0(0%)	1(1%)	0(0%)	0(0%)
MA	Match	0(0%)	0(0%)	1(1%)	0(0%)
AO	Add On	6(4%)	0(0%)	3(2%)	3(2%)
DF	Count Down from	2(1%)	4(3%)	8(5%)	14(9%)
UG	Count Up from Given	5(3%)	11(7%)	11(7%)	18(12%)
DT	Count Down to	0(0%)	0(0%)	0(0%)	2(1%)
HU	Heuristic	4(3%)	2(1%)	7(5%)	4(3%)
#F	Number Fact	27(18%)	31(21%)	9(6%)	11(7%)
GU	Guess	3(2%)	4(3%)	4(3%)	16(11%)
GI	Given Number	9(6%)	13(9%)	7(5%)	6(4%)
OP	Wrong Operation	7(5%)	7(5%)	4(3%)	5(3%)
M	Miscount	5(3%)	6(4%)	17(11%)	19(13%)
F	Forgets Data	1(1%)	4(3%)	6(4%)	2(1%)
	Not administered	0(0%)	2(1%)	5(3%)	11(7%)

Table 10

Task 4 (Addition-Part-Part-Whole)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	68(45%)	0(0%)	91(61%)	0(0%)
F	Fingers	10(7%)	57(38%)	14(9%)	66(44%)
N	No Action	72(48%)	89(59%)	40(27%)	66(44%)
O	Other	0(0%)	1(1%)	0(0%)	2(1%)
Y	Correct	137(91%)	137(91%)	126(84%)	99(66%)
UN	Uncodable	9(6%)	14(9%)	2(1%)	9(6%)
?	Confusion	0(0%)	0(0%)	0(0%)	4(3%)
CS	Counts On from Smaller	6(4%)	19(13%)	13(9%)	31(21%)
CL	Counts On from Larger	29(19%)	24(16%)	37(25%)	49(33%)
S	Subitizing	5(3%)	13(9%)	0(0%)	3(2%)
CA	Counts All	50(33%)	22(15%)	70(47%)	19(13%)
HU	Heuristic	2(1%)	0(0%)	6(4%)	5(3%)
#F	Number Fact	45(30%)	54(36%)	13(9%)	8(5%)
GU	Guess	1(1%)	1(1%)	4(3%)	6(4%)
GI	Given Number	2(1%)	0(0%)	0(0%)	3(2%)
OP	Wrong Operation	0(0%)	0(0%)	0(0%)	0(0%)
M	Miscount	2(1%)	6(4%)	13(9%)	19(13%)
F	Forgets Data	3(2%)	0(0%)	1(1%)	3(2%)
	Not administered	1(1%)	3(2%)	5(3%)	13(9%)

Table 11

Task 5 (Subtraction-Comparison)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	72(48%)	0(0%)	91(61%)	0(0%)
F	Fingers	10(7%)	54(36%)	12(8%)	41(27%)
N	No Action	67(45%)	90(60%)	40(27%)	78(52%)
O	Other	0(0	1(1%)	0(0%)	0(0%)
Y	Correct	108(72%)	97(65%)	85(57%)	58(39%)
UN	Uncodable	21(14%)	24(16%)	10(7%)	18(12%)
?	Confusion	2(1%)	4(3%)	4(3%)	20(13%)
F	Separate from	16(11%)	9(6%)	21(14%)	3(2%)
T	Separate to	1(1%)	0(0%)	0(0%)	0(0%)
MA	Match	31(21%)	5(3%)	50(33%)	0(0%)
AO	Add On	3(2%)	8(5%)	7(5%)	7(5%)
DF	Count Down from	4(3%)	2(1%)	2(1%)	0(0%)
UG	Count Up from Given	9(6%)	27(18%)	17(11%)	34(23%)
DT	Count Down to	0(0%)	1(1%)	0(0%)	2(1%)
HU	Heuristic	3(2%)	5(3%)	7(5%)	5(3%)
#F	Number Fact	30(20%)	30(20%)	4(3%)	10(7%)
GU	Guess	3(2%)	5(3%)	4(3%)	15(10%)
GI	Given Number	14(9%)	16(11%)	10(7%)	14(9%)
OP	Wrong Operation	12(8%)	11(7%)	9(6%)	5(3%)
M	Miscount	5(3%)	3(2%)	23(15%)	11(7%)
F	Forgets Data	3(2%)	5(3%)	6(4%)	4(3%)
	Not administered	1(1%)	3(2%)	5(3%)	17(11%)

Table 12

Task 6 (Addition-Joining-missing addend)

Number (%) of Children Coded for a Particular Behavior

		Level			
		b+	b-	c+	c-
C	Cubes	63(42%)	0(0%)	0(0%)	0(0%)
F	Fingers	12(8%)	56(37%)	18(12%)	64(43%)
N	No Action	75(50%)	91(61%)	37(25%)	66(44%)
O	Other	1(1%)	0(0%)	0(0%)	2(1%)
Y	Correct	133(89%)	132(88%)	114(76%)	92(61%)
UN	Uncodable	6(4%)	16(11%)	9(6%)	9(6%)
?	Confusion	0(0%)	0(0%)	0(0%)	4(3%)
F	Separate from	2(1%)	1(1%)	5(3%)	1(1%)
T	Separate to	0(0%)	0(0%)	0(0%)	0(0%)
MA	Match	0(0%)	0(0%)	3(2%)	0(0%)
AO	Add On	47(31%)	30(20%)	70(47%)	21(14%)
DF	Count Down from	0(0%)	0(0%)	0(0%)	0(0%)
UG	Count Up from Given	30(20%)	39(26%)	27(18%)	65(43%)
DT	Count Down to	0(0%)	0(0%)	0(0%)	1(1%)
HU	Heuristic	3(2%)	3(2%)	8(5%)	8(5%)
#F	Number Fact	51(34%)	49(33%)	12(8%)	11(7%)
GU	Guess	1(1%)	0(0%)	3(2%)	8(5%)
GI	Given Number	1(1%)	1(1%)	1(1%)	4(3%)
OP	Wrong Operation	8(5%)	8(5%)	6(4%)	1(1%)
M	Miscount	3(2%)	4(3%)	17(11%)	12(8%)
F	Forgets Data	1(1%)	1(1%)	2(1%)	5(3%)
	Not administered	1(1%)	3(2%)	6(4%)	17(11%)

Table 13

Number of Correct Responses Per Task Across Levels

Task	Level			
	b+	b-	c+	c-
1	138	137	125	106
2	134	129	111	68
3	119	104	105	64
4	137	137	126	99
5	108	97	85	58
6	133	132	114	92

than the others, a comparison was also made between the averages for the two addition problems and the averages for the two easier subtraction problems. Table 14 demonstrates the relative difficulties. For the smaller number problems, the difference between the two addition tasks and the two easier subtraction tasks is negligible.

Similarity of Response Patterns for the Two Addition Tasks

An earlier pilot study (Carpenter, Hiebert and Moser, Note 6) used the same two addition tasks and found almost no difference in the responses given by children to those tasks. The results from the third interview reflect this same consistency of response. It would appear that children of the age represented by this sample do not differentiate between an action-oriented Joining addition problem and a static Part-Part-Whole addition problem. Table 15 presents the contrasts between the two problems on a level-by-level basis.

Subtraction Strategies and Problem Structure

Unlike the monolithic characterization of addition in the previous section, subtraction is not amenable to a single simple interpretation. A number of writers (e.g., Gibb, 1956) have suggested three interpretations, or structures, underlying subtraction. They are the subtractive, the additive, and the comparative. The four problem tasks were chosen with this categorization in mind. Task 2, Separating, reflects the subtractive notion in that its semantic structure strongly suggests the use of the separating or take-away strategy. Task 6, Joining, missing addend, reflects the additive notion in that its semantic structure suggests the additive strategy of adding-on or making a smaller set larger. Task 5, Comparison, reflects the static notion of comparison by suggesting neither adding on

Table 14

Average Number of Correct Responses for

Addition and Subtraction Problems by Level

Type	Level			
	b+	b-	c+	c-
Tasks 1, 4 (Addition)	138	137	126	103
Tasks 2, 3, 5, 6 (Subtraction)	124	116	104	71
Tasks 2, 6 (Easier Subtraction)	134	131	113	80

Table 15

Number of Responses on Two Verbal Addition Problems

	Model			Correct	Strategy				
	C	F	N	Y	CA	CS	CL	#F	HL
b+ Joining	70	14	67	138	50	8	23	48	5
Part-Part-Whole	68	10	72	137	50	6	29	45	2
b- Joining	0	55	92	137	26	21	21	63	2
Part-Part-Whole	0	57	89	137	22	19	24	54	0
c+ Joining	89	14	43	12	70	17	33	17	3
Part-Part-Whole	91	14	40	126	70	13	37	13	6
c- Joining	0	70	69	106	22	34	42	18	3
Part-Part-Whole	0	66	66	99	19	31	49	8	5

nor taking away, but rather a matching or contrasting of two sets. Task 3, Part-Part-Whole, missing addend, is the least suggestive of the four subtraction tasks since its semantic structure does not clearly indicate what strategy is most appropriate.

For purposes of discussion, the Separating From (F), Separating To (T), Counting Down From (DF) and Counting Down To (DT) strategies will be aggregated into a single subtractive category. Similarly, the Adding On (AO) and Counting Up from Given (UG) strategies will be aggregated into a single additive strategy. And finally, Matching (MA) is essentially the comparative strategy. Table 16 presents the frequency of these combined strategy categories for each of the four subtraction problem types across the four levels. The data suggest that problem structure is a strong factor in the choice of strategy.

For Separating and Joining, missing addend, the correspondence between problem structure and strategy used is obviously very strong. While the use of the comparative (Matching) strategy with the Comparison problem is not as predominant, the argument for the influence of problem structure on strategy choice is still supported in that the Matching strategy essentially appeared nowhere but in the Comparison problem. For those children who had the Matching strategy within their repertoire of problem-solving processes, the semantic structure of the Comparison problem was strong enough to evoke that strategy. Matching is virtually impossible without manipulatives, which accounts for the virtual absence of Matching at the b- and c- levels.

The data for the Part-Part-Whole, missing addend problem present a less clear picture. The most often used strategy at all levels is the subtractive

Table 16

Number of Responses for Differe: Subtraction Strategies by Problem and Level

Level	problem type	Strategies		
		Subtractive	Additive	Comparative
b+	Separating	98	0	0
	Joining, missing addend	2	77	0
	Comparison	21	12	31
	Part-Part-Whole, missing addend	74	11	0
b-	Separating	80	10	0
	Joining, missing addend	1	69	0
	Comparison	12	35	5
	Part-Part-Whole, missing addend	52	11	0
c+	Separating	110	19	0
	Joining, missing addend	5	97	3
	Comparison	23	24	50
	Part-Part-Whole, missing addend	91	14	1
c-	Separating	60	14	0
	Joining, missing addend	2	86	0
	Comparison	5	41	0
	Part-Part-Whole, missing addend	42	21	0

one. Yet the overwhelming numerical difference between the subtractive and additive strategies that occurs in the Separating problem is not present for this problem. Of particular note is the contrast between subtractive and additive strategies at the c- level. In this situation there appears to be other factors determining the children's choice of strategy. A protracted discussion of what those factors might be is not appropriate for this report.

The mental strategies, Number Fact and Heuristic, are not included in this analysis, because it was impossible to tell from the coding whether the Number Fact or Heuristic was used or developed additively, subtractively, or comparatively.

The "Mental" Strategies

Throughout the first year of instruction that the children receive in class, the memorization of the number facts from 0-10 is encouraged. This fact is reflected in the high use of number facts and heuristics at the b+ and b- level. In the addition problems, Tasks 1 and 4, Number Fact and Heuristic combined is the most common strategy used to solve the smaller number problems. In the subtraction problems, the "mental" strategies, Number Fact and Heuristic, are the second most commonly used set of strategies for the smaller number problems.

Less Frequently Occurring Strategies

During this third interview a number of the possible student response behaviors in somewhat isolated instances were observed. The two counting down strategies, Counting Down From and Counting Down To, appeared rather infrequently. However, in Task 2, Separating problem, the Counting Down From strategy was chosen at least 9% of the time, with the highest percentage, 14%, occurring at the c- level. Although backward counting skills are not

apparently highly developed in first-graders, the children are associating counting down with the subtractive task more often than with the comparative or additive tasks.

Errors

No task was free of error, although the greater difficulty of the Comparison (Task 5) and the Part-Part-Whole, missing addend problems (Task 3) is reflected in the higher incidence of errors. Children's lack of comprehension of the structure of these two problems would be attributed as the cause for the cases in which one of the given numbers was supplied as the answer. Overall, miscounting was the most frequent error This occurred whether the children used cubes or their fingers or just counted mentally. A summary of the frequency of errors is presented in Table 17.

Secondary Analyses of Data

The data analyses contained in this section concern pupil performance rather than results for specific tasks as in the previous section. The patterns apparent in an individual student's response will be considered. In the first two subsections the relationship between a particular type of strategy or model employed and the correctness of response is examined. In the third section we will examine the consistency of a particular strategy across several tasks.

Relationship of Strategy Employed to Correctness of Response

The basic question of interest in this analysis is, "If a child employed a particular strategy, was the problem also solved correctly?" Data answering this question are presented in Tables 18 to 21, which aggregate information by levels b+, b-. c+, and c- respectively.

Table 17

Frequency of Errors Across the Six Problem Tasks

Task	Level	Error Types					
		Miscount	Forgets data	Use wrong operation	Given #	Guess	Interview terminated
1 Joining	b+	5	1	0	1	4	0
	b-	6	0	0	0	1	2
	c+	18	0	4	0	1	5
	c-	21	5	1	1	4	11
2 Separating	b+	9	2	1	1	2	0
	b-	5	6	1	0	2	2
	c+	20	3	1	2	2	5
	c-	27	0	2	4	6	11
3 Part-Part-Whole, missing addend	b+	5	1	7	9	3	0
	b-	6	4	7	13	4	2
	c+	17	6	4	7	4	5
	c-	19	2	5	6	16	11
4 Part-Part-Whole	b+	2	3	0	2	1	1
	b-	6	0	0	0	1	3
	c+	13	1	0	0	4	5
	c-	19	3	0	3	6	13
5 Comparison	b+	5	3	12	14	3	1
	b-	3	5	11	16	5	3
	c+	23	6	9	10	4	5
	c-	11	4	5	14	15	17
6 Joining, missing addend	b+	3	1	8	1	1	1
	b-	4	1	8	1	0	3
	c+	17	2	6	1	3	6
	c-	12	5	1	4	8	17

Table 18

Level b+: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	8(88%)[a]	-	-	6(100%)	-	-	14(93%)
CL	23(100%)	-	-	29(93%)	-	-	52(96%)
CA	50(92%)	-	-	50(98%)	-	-	100(95%)
F	-	85(92%)	72(93%)	-	16(81%)	2(50%)	175(91%)
T	-	0	0	-	1(100%)	0	1(100%)
MA	-	0	0	-	31(94%)	0	31(94%)
AO	-	0	6(100%)	-	3(100%)	47(96%)	56(96%)
DI	-	13(77%)	2(50%)	-	4(100%)	0	19(79%)
UG	-	0	5(100%)	-	9(89%)	30(100%)	44(98%)
DT	-	0	0	-	0	0	0
HU	5(100%)	7(100%)	4(100%)	2(100%)	3(100%)	3(67%)	24(96%)
GU	4(0%)	2(0%)	3(0%)	1(0%)	3(0%)	1(0%)	14(0%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

Table 19

Level b-: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	21(86%)[a]	-	-	19(89%)	-	-	40(88%)
CL	21(90%)	-	-	24(92%)	-	-	45(91%)
CA	26(96%)	-	-	22(91%)	-	-	48(94%)
F	-	65(88%)	47(91%)	-	9(89%)	1(100%)	122(89%)
T	-	0	1(100%	-	0	0	1(100%)
MA	-	0	0	-	5(80%)	0	5(80%)
AO	-	1(0%)	0	-	8(88%)	30(93%)	39(90%)
DF	-	12(92%)	4(50%)	-	2(100%)	0	18(83%)
UG	-	9(100%)	11(91%)	-	27(93%)	39(95%)	86(94%)
DT	-	3(100%)	0	-	1(100%)	0	4(100%)
HU	2(100%)	3(66%)	2(100%)	0	5(80%)	3(100%)	15(87%)
GU	1(0%)	2(0%)	4(0%)	1(0%)	5(20%)	0	13(8%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

Table 20

Level c+: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	17(88%)[a]	-	-	13(100%)	-	-	30(93%)
CL	33(88%)	-	-	37(86%)	-	-	70(87%)
CA	70(83%)	-	-	70(87%)	-	-	140(85%)
F	-	96(81%)	83(81%)	-	21(71%)	5(100%)	205(80%)
T	-	0	0	-	0	0	0
MA	-	0	1(0%)	-	50(66%)	3(100%)	54(67%)
AO	-	1(100%)	3(100%)	-	7(71%)	70(83%)	81(83%)
DF	-	13(69%)	8(75%)	-	2(50%)	0	23(70%)
UG	-	9(100%)	11(91%)	-	17(94%)	27(89%)	64(92%)
DT	-	1(100%)	0	-	0	0	1(100%)
HU	3(100%)	8(63%)	7(86%)	6(100%)	7(71%)	8(88%)	39(82%)
GU	1(0%)	2(0%)	4(25%)	4(0%)	4(0%)	3(0%)	18(6%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

Table 21

Level c-: Number of Children Employing a Strategy and Their Rate of Success

Strategy	Task 1	2	3	4	5	6	Total
CS	34(82%)[a]	-	-	31(71%)	-	-	65(77%)
CL	42(83%)	-	-	49(90%)	-	-	91(87%)
CA	22(50%)	-	-	19(68%)	-	-	41(59%)
F	-	35(49%)	26(62%)	-	3(100%)	1(100%)	65(57%)
T	-	0	0	-	0	0	0
MA	-	0	0	-	0	0	0
AO	-	2(50%)	3(67%)	-	7(71%)	21(81%)	33(76%)
DF	-	21(52%)	14(57%)	-	0	0	35(54%)
UG	-	12(75%)	18(83%)	-	34(71%)	65(85%)	129(80%)
DT	-	4(50%)	2(100%)	-	2(100%)	1(100%)	9(78%)
HU	3(100%)	8(88%)	4(50%)	5(80%)	5(80%)	8(50%)	33(73%)
GU	4(0%)	6(17%)	16(6%)	15(7%)	8(0%)	55(7%)	

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly

The results for the following behaviors do not appear in the tables because they are inappropriate to our discussion.

1. Number Fact. A requisite for coding Number Fact is that the child's response must be correct. There were 233 responses coded as Number Fact in b+, 264 in b-, 61 in c+, and 73 in c-.

2. ? or confusion. A requisite for this coding is that the child gives no answer; therefore it could not be coded right or wrong. There were 3 such responses in level b+, 8 in b-, 5 in c+, and 59 in c-.

3. Uncodable. No strategy could be identified, even when the answer was correct. Of the 64 uncodable responses in level b+, 75% were correct; of the 102 uncodable responses in level b-, 70% were correct; of the 38 uncodable responses in level c+, 53% were correct; of the 82 uncodable responses in level c-, 50% were correct.

4. Wrong Operation. If the children used the wrong operation (for example, adding instead of subtracting), the answer was always incorrect. There were 28 responses in level b+ that were coded wrong operation, 27 in b-, 20 in c+, and 14 in c-.

5. Given Number. If a child responded with a number given in the problem, it was always an incorrect answer. There were 28 such responses in level b+, 30 in b-, 20 in c+, and 32 in c-.

The entries in Tables 18-21 present the number of children who used a certain strategy for a certain task. That number is followed by a percentage figure in parentheses, which represents the portion of those children using the strategy who also got the correct answer.

For example, in the example below, of the 8 children who used the counting up from smaller strategy for Task 1, 88% (which is to say, 7 of them) also

solved the task correctly.

	Task	
Strategy	1	2
CS	8(88%)	-

In the example, a dash appears on the CS cell for Task 2. A dash indicates the strategy would be inappropriate for this task. In the example, CS is an addition strategy and thus was not coded for Task 2, a subtraction problem.

There is no clear cut pattern indicating that one particular strategy appears to be more successful than any other. This reflects the fact that errors that occur are randomly distributed across tasks and levels.

Relationship of Model Used to Correctness of Response

We also investigated the relationship between a particular modeling behavior and the rate of correct responses. Tables 22-25 present the results. In the Model category the possible responses were cubes, fingers, no action, other (physical), or a combination of cubes and fingers. Uncodable model responses, confused responses, and combination of models other than cubes and fingers were not considered in the tabulation of these results.

The tables present the number of children who used a particular model for each task and the percentage of those children whose answer to the task was correct. As was the case with strategies, there is no definite pattern of success for a particular modeling behavior. Thus, no reliable conclusions can be drawn from these data.

Consistency of Student Response

We also investigated whether a child who exhibited a particular response on a problem task would tend to exhibit that behavior on another task. More specifically, does a child show a consistent pattern of response, exhibiting the same behavior every time it is appropriate? Such consistency of behavior could indicate a child's interpretation of the operation of addition or subtraction. If, in a given level, a child used an additive strategy consistently over all four subtraction tasks, such consistency could indicate that the child has formed an interpretation of subtraction that is independent of the structure of a problem.

Consistency is examined in two ways. In the first, behavior was summarized across all the tasks administered within a specific level. In the second analysis, consistency was considered for a single task across all the levels in which it appeared. The total population of 150 subjects was used in this analysis. In addition to considering use of model, correctness, and strategies, this analysis treated several combined strategies. The combined strategies represent similar patterns of thinking. The following combined strategies have been created for this analysis:

CE- The student responded either CL (Counts Up from Larger) or CS (Counts Up from Smaller).

SEP- The student responded either F (Separates From) or T (Separates To).

CTD- The student responded either DF (Counts Down From) or DT (Counts Down To).

SF- The student responded either F(Separates From) or DF (Counts Down From).

Table 22

Level b+: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	69(96%)[a]	75(92%)	81(83%)	67(97%)	71(69%)	62(87%)	425(87%)
Fingers alone	13(85%)	13(85%)	10(80%)	9(67%)	9(67%)	10(70%)	64(77%)
Cubes and Fingers	1(0%)	1(100%)	0	1(100%)	1(100%)	1(100%)	5(80%)
No action	67(91%)	61(87%)	58(76%)	72(90%)	67(78%)	75(95%)	400(87%)
Other	0	0	0	0	0	0	0

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Table 23

Level b-: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	NA	NA	NA	NA	NA	NA	NA
Fingers alone	55(89%)[a]	74(84%)	65(74%)	57(93%)	54(56%)	56(80%)	361(80%)
Cubes and Fingers	NA	NA	NA	NA	NA	NA	NA
No action	92(95%)	72(90%)	80(69%)	89(94%)	90(96%)	91(96%)	514(87%)
Other	1(100%)	2(100%)	1(100%)	1(0%)	1(0%)	0	6(67%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Note: NA indicates the strategy is not applicable to this task

Table 24

Level c+: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	88(86%)[a]	96(77%)	94(71%)	91(89%)	90(57%)	89(79%)	548(76%)
Fingers alone	13(69%)	12(83%)	12(83%)	14(100%)	11(91%)	18(83%)	80(85%)
Cubes and Fingers	1(0%)	1(100%)	1(100%)	0	1(100%)	0	4(75%)
No action	43(93%)	36(72%)	37(93%)	40(78%)	40(58%)	37(78%)	233(76%)
Other	0	0	0	0	0	0	0

[a] Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Table 25

Level c-: Number of Children Employing a Model and Their Rate of Success

	Task						
Model	1	2	3	4	5	6	Total
Cubes alone	NA	NA	NA	NA	NA	NA	NA
Fingers alone	69(67%)[a]	64(39%)	56(54%)	65(72%)	41(66%)	62(84%)	357(64%)
Cubes and Fingers	A	NA	NA	NA	NA	NA	NA
No action	69(86%)	64(64%)	72(44%)	66(76%)	78(40%)	66(58%)	415(61%)
Other	0	1(100%)	2(100%)	1(100%)	0	0	4(100%)

[a]Numbers in parentheses give the percentage of the children in that cell who solved the problem task correctly.

Note: NA indicates the strategy is not applicable to this task.

AD- The student responded either AO (Add On) or UG (Counts Up From Given).

ST- The student responded either T (Separates To) or DT (Counts Down To).

ADV- The student responded either with #F (Number Fact) or HU (Heuristic).

In general, the results show the following:

1. Within a level, once the children decide to use cubes, fingers, or no action as a model, they are fairly consistent in that use. They are also consistent in use of cubes across tasks.

2. Overall, the children are somewhat consistent in the use of strategies for addition tasks. However, there is little consistency in the subtraction tasks across level, which is to be expected if, as indicated previously in this report, problem structure is a major determining factor in children's choice of strategy.

3. Children were more consistent in choice of strategy for the Separating and the Part-Part-Whole, missing addend tasks across levels than for the Comparison and the Joining, missing addend tasks.

The cases where children were consistent, that is, where 3 or more children gave a response the maximum number of times possible, are detailed in Tables 26 and 27.

Conclusion

This is the third in a series of reports on the data from the individual interviews for the Coordinated Study. Each report contains data for only one round of interviewing, and is not concerned with results or changes across time. The longitudinal findings will be presented in separate reports. For subsequent and previous reports in the individual interview series and for additional information and reports concerning the Coordinated Study, contact the Mathematics Work Group at the Wisconsin Research and Development Center for Individualized Schooling, Madison, Wisconsin.

Table 26

Number of Children Who Gave Response

Maximum Number of Times Across Tasks by Levels

Model or strategy	Maximum responses possible	Level			
		b+	b-	c+	c-
Cubes	6	43	NA	61	NA
Fingers	6	3	29	4	19
No action	6	35	50	16	31
Correct	6	67	65	50	19
CS	2	-	10	3	18
CL	2	13	10	18	24
CA	2	33	15	54	12
CE	2	18	25	32	60
UG	4	-	-	-	6
AD	4	-	-	3	7
AF	6	9	9	-	-
ADV	6	11	10	-	3

Note: NA indicates the strategy is not applicable to this task.

- (hyphen) indicates that the number of children who gave a response the maximum number of times was less than three.

Table 27

Number of Children Who Gave Response

Maximum Number of Times Across Levels by Task

Model or strategy	Maximum responses possible	Task					
		1	2	3	4	5	6
Cubes	2	62	69	71	62	59	55
Fingers	4	4	5	-	3	3	4
No action	4	29	25	25	33	26	29
Correct	4	86	51	43	81	42	78
CL	4	-	NA	NA	5	NA	NA
CA	4	8	NA	NA	5	NA	NA
CE	4	5	NA	NA	11	NA	NA
F	4	NA	23	16	NA	-	-
SEP	4	NA	23	16	NA	-	-
SF	4	NA	35	22	NA	-	-
AO	4	NA	-	-	NA	-	5
AD	4	NA	-	-	NA	-	26
#F	4	8	-	3	4	-	6
ADV	4	12	5	5	8	3	3

Note: NA indicates the strategy is not applicable to this task.

-(hyphen) indicates that the number of children who gave a response the maximum number of times was less than three.

Reference Notes

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4. Martin, C. & Moser, J.M. Interviewer training procedures (Working Paper). Madison: Wisconsin Research and Development Center for Individualized Schooling, 1980.

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6. Carpenter, T.P., Hiebert, J. & Moser, J.M. The effect of problem structure on first-graders' initial solution processes for simple addition and subtraction problems (Technical Report No. 516). Madison: Wisconsin Research and Development Center for Individualized Schooling, 1979.

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Gibb, E.G. Children's thinking in the process of subtraction. Journal of Experimental Education, 1956, 25, 71-80.

Romberg, T.A., Harvey, J.G., Moser, J.M. & Montgomery, M.E. Developing Mathematical Processes. Chicago: Rand McNally and Co., 1974.

APPENDIX A

PROBLEM TASKS BY LEVEL

Level b+

1. Kay had ____ flowers.

Her sister gave her ____ more flowers.

How many flowers did Kay have altogether?

2. Helen had ____ turtles.

She gave ____ turtles to Aaron.

How many turtles did Helen have left?

3. ____ children are playing ball.

____ are boys and the rest are girls. How

many girls are playing ball?

4. ____ big dogs are in the yard.

There are also ____ small dogs in the yard.

How many dogs are in the yard?

5. Doug has ____ fishing poles.

His sister Ruth has ____ fishing poles.

How many more fishing poles does Ruth have than Doug?

6. Warren has ____ stones. How many more stones

does he have to put with them to have ____ stones altogether?

Level b-

1. Duane had ____ comic books.

His brother gave him ____ more comic books.

How many comic books did Duane have altogether?

2. Roger had ____ peanuts.

He gave ____ peanuts to the elephants

How many peanuts did Roger have left?

3. ____ mice are in a cage.

____ are brown and the rest are white.

How many white mice are in the cage?

4. Julie has ____ big buckets.

She also has ____ little buckets.

How many buckets does Julie have altogether?

5. Chuck has ____ snails.

His sister Donna has ____ snails.

How many more snails does Donna have than Chuck?

6. Ben has ____ raisins.

How many more raisins does he have to put with them

to have ____ raisins altogether?

Level c+

1. Diane had ____ rings.

Her father gave her ____ more rings.

How many rings did Diane have altogether?

2. Wayne had ____ strawberries.

He gave ____ strawberries to Rita.

How many strawberries did Wayne have left?

3. ____ clowns are in a car.

____ are happy and the rest are sad.

How many sad clowns are in the car?

4. Greg has ____ long boards.

He also has ____ short boards.

How many boards does Greg have altogether?

5. Beverly has ____ cookies.

Her friend Rodney has ____ cookies.

How many more cookies does Beverly have

than Rodney?

6. Jeanne has 8 tickets.

How many more tickets does she have to put

with them so she has 14 tickets altogether?

Level c-

1. Edward had ____ toy sailboats.

His friend gave him ____ more toy sailboats.

How many sailboats did Edward have altogether?

2. Charlotte had ____ muffins.

She gave ___ of them to Rich.

How many muffins did Charlotte have left?

3. ____ candy eggs are in a basket.

____ are vanilla and the rest are chocolate.

How many chocolate eggs are in the basket?

4. ____ men are swimming.

___ women are swimming.

How many grownups are swimming?

5. Carla has ____ keys.

Her friend Larry has ____ keys.

How many more keys does Larry have than Carla?

6. Rov has ____ stickers.

How many more stickers does he have to put with them

so he has ____ stickers altogether?

APPENDIX B

INDIVIDUAL STUDENT PROFILES

101	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C N F M	C Y CA -	C Y UN -	C Y #F -
b-	N Y #F -	F Y F -	F Y F -	F Y S -	F Y F -	F Y AO -
c+	C Y CA -	C Y F -	C N F M	C Y CA -	C Y MA -	C N AO M
c-	F N CA M	N Y F -	O Y UN -	N Y CL -	N Y #F -	F N UG -

102	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C N F M	C Y F -	C Y CA -	C N OP O	C N OP O
b-	F N CA M	F Y F -	F Y F -	F Y #F -	F N OP O	F N OP O
c+	C Y CA -	C N OP O	C N OP O	C Y CA -	C N OP O	C N OP O
c-						

103	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y DF -	- ? ? -	N Y CA -	C Y #F -	F Y AO -
b-	F Y CL -	N Y DF -	F Y UG -	F Y CS -	- ? ? -	F Y AO -
c+	C N CA M	F N HU -	- ? ? -	C N CA M	- ? ? -	C Y AO -
c-	F Y CA -	F N F M	- ? ? -	F Y CA -	- ? ? -	N N GI GI

104	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y F -	N N OP O	N Y CL -	N Y T -	N Y UG -
b-	N Y CL -	N Y DF -	N ? ? -	C Y CL -	F Y F -	N Y UG -
c+	C Y CA -	C Y F -	N N GI GI	N Y CA -	C Y F	I Y AO -
c-	N Y CL -	- ? ? -	- ? ? -	N Y CL -	F Y F -	N Y UG -

105	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N N #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
b–	N N GU –	N Y #F –	N Y #F –	N Y #F –	N N GU –	N Y #F –
c+	N Y CS –	N Y UG –	C Y F –	N Y CA –	C N MA F	N N UG M
c–	N N CA M	N Y UN –	N Y UN –	N Y CS –	N Y UN –	N N UN –

106	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b	F N CS M	N Y HU –	N Y F –	N N UN –	N Y UN –	N Y #F –
b–	N [illegible] UN –	N Y UN –	N N UN –	N Y UN –	N Y UG –	N Y UG –
c+	N N CS M	N N DF M	C Y F –	N N CL M	N N OP O	N N OP O
c–	N N CL M	N N OP M	N N OP M	F N CS M	F N AO M	N Y UG –

107	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	C Y F –	C Y F –	N Y #F –	C N OP O	F Y UG –
b–	N Y #F –	F Y UN –	N N OP O	N Y CL –	N Y UG –	N Y UG –
c+	N Y CL –	C N F M	C N OP O	C N CA M	C Y MA –	C Y AO –
c–	N Y CL –	– ? ? –	N N OP O	N Y CL –	N ? ? –	N Y UG –

108	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA M	C N F M	C N F M	C Y CA –	C Y MA –	C Y UC –
b–	F Y CA –	F Y F –	F N GI GI	F Y CA –	F N UN –	F N UN –
c+	C Y CA –	C Y F –	C N GI GI	C Y CA –	C Y MA –	C N AO M
c–	F N CA M	F N F M	C N GI GI	F Y CA –	F N UN –	F Y AO –

109	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C N OP O	C Y CA –	C N OP O	C Y AO –
b–	N Y #F –	F Y F –	F N F M	F Y S –	F N OP O	F Y AO –
c+	C Y CA –	C Y F –	C N GI GI	C Y CA –	C N OP O	C N AO M
c–	F N CS M	F N OP O	F N OP O	F N CA M		

110	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y AO –
b–	F Y S –	F Y F –	F Y F –	F N CA M	F Y F –	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N MA M	C N AO M
c–	F Y CS –	F Y DF –	F N DF M	F Y CS –	N N GU –	F Y UG –

111	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS –	C Y F –	C Y F –	C Y #F –	C Y MA –	C Y #F –
b–	N Y #F –	N Y UN –	N Y UN –	N Y #F –	F N AO M	N Y #F –
c+	C N CA M	C N F M	C Y F –	C Y CS –	C Y MA –	C Y AO –
c–	F N CA M	F N F M	F Y F –	F Y CA –	– ? ? –	F Y HU –

112	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	N GU –	C Y AO –
b–	F CA –	F N F M	F N GI GI	F Y CL –	N Y HU –	F Y HU –
c+	C Y CA –	C N GI GI	C N F M	C Y CL –	C N MA F	C Y AO –
c–	N Y CS –	– ? ? –	– ? ? –	N Y CS –	– ? ? –	F Y UG –

113	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C N F M	C Y F –	C Y #F –	C Y MA –	C Y AO –
b–	N Y #F –	N Y #F –	N N GI GI	N Y #F –	N Y #F –	N Y UN –
c+	C Y CS –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y F –
c–	N Y #F –	– ? ? –	N N GU –	F Y CA –	N N GU –	F Y AO –

114	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C N OP O	C Y CA –	C Y MA –	C Y AO –
b–	F Y CA –	F N F F	F Y F –	F Y CA –	F ? ? –	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y F –
c–	F Y CA –	F Y F –	F Y F –	F Y CA –	– ? ? –	F Y UG –

115	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA –	F Y F –	F N UN –	N Y CL –	F Y F –	N Y #F –
b–	F Y CA –	F Y F –	– ? ? –	F Y CL –	F Y F –	F Y F –
c+	F Y CA –	F Y F –	F N UN M	F Y CA –	C Y F –	C Y AO –
c–	F Y CS –	F ? ? –	F ? ? –	F N UN –		

116	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N F M	C Y AO –
b–	F N CS M	F Y F –	F Y F –	F Y S –	F N UN –	F Y UG –
c+	C Y CA –	C Y F –	C Y F –	N Y #F –	C N F F	C Y AO –
c–	F N CS M	F N F M	F N F M			

117	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
[illegible]	N Y #F –	N Y #F –	N N GU –	N Y #F –	N Y #F –	N Y #F –
c+	N Y HU –	N Y DF –	C Y F –	C Y CA –	C N AO M	C N [illegible] M
c–	N Y CS –	N N UG M	N Y #F –	N Y HU –	N N OP O	N Y HU –

118	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N N GU F
b–	N Y #F –	N Y UG –	N Y UG –	N Y #F –	N Y #F –	N Y #F –
c+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c–	N Y #F –	N Y #F –	N Y UG –	N Y #F –	N Y #F –	N N #F F

119	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	– ? ? –	C Y AO –
b-	F Y CA –	F Y F –	F Y F –	F Y S –	– ? ? –	F Y AO –
c+	C Y CA –	C Y F –	C N F M	C Y CA –	C N OP O	C Y AO –
c–	F Y CL –	F Y F –	F Y F –	F Y CA –	– ? ? –	F Y AO –

120	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	N N #F –	[illegible] Y #F –	N Y HU –
b–	F Y CA –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	C Y CS –	C Y F –	C Y F –	C Y #F –	C Y UG –	N Y HU –
c–	N N GU –	N Y #F –	N Y UG –	N N GU F	N Y #F –	N N HU –

122	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N OP O	C N OP O
b-	F Y CS -	F Y F -	F N DF F	F Y CS -	F N GI GI	F Y AO -
c+	C N CA M	C Y F -	C Y F -	C Y CA -	C N OP O	C N OP O
c-	F Y CS -	F N F M	N N F M	F N CL M		

123	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	C Y F -	C Y F -	C Y #F -	C Y #F -	N Y #F -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
c+	N N GU -	N Y #F -	C Y F -	C Y CS -	N Y UG -	N Y UG -
c-	N Y CS -	N Y UG -	N N UG M	N Y CL -	F Y UG -	F Y UG -

124	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C N F F	N Y #F -	N Y #F -	N Y #F -	N Y #F -
b-	F Y CS -	F N F M	F N F F	N Y #F -	F Y UN -	N Y #F -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N MA M	F Y UG -
c-	F Y CS -	N Y HU -	F Y UG -	F Y CS -	F Y UG -	F Y UG -

127	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	N Y #F -
b-	F Y S -	F Y F -	F Y F -	F Y S -	N Y UN -	F Y AO -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	F Y CA -	F Y F -	F Y F -	F Y S -	- ? ? -	F Y UG -

128	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	F Y F -	F N OP O	F N CL F	F N F F	F N OP O
b-	N Y "F -	F Y UG -	F N OP O	F Y #F -	F N OP O	F N OP O
c+	F Y CL -	F Y F -	F Y F -	F Y CL -	F N OP O	F N OP O
c-	F Y CL -	F Y DF -	F N OP O	F Y CL -	F N OP O	F N OP O

129	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y HU -	N N OP O	N Y CL -	N Y #F -	N Y #F -
b-	N Y #F -	N Y #F -	N N OP O	N Y #F -	N Y HU -	N Y UG -
c+	N Y #F -	N Y UN -	N Y UN -	N Y UN -	N Y HU -	N Y HU -
c-	N Y UN -	- ? ? -	N N OP O	N Y #F -	N Y #F -	N Y #F -

130	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N OP O	N Y #F -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
c+	N Y #F -	N Y DF -	N Y #F -	N Y HU -	N Y UN -	N Y #F -
c-	N Y #F -	N Y UN -	N N GU -	N Y #F -	N Y #F -	N Y #F -

131	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	N Y #F -	C Y #F -	C Y #F -	C Y MA -	C Y #F -
b-	F N CL M	F Y F -	F Y F -	F Y CL -	F Y UN -	F Y #F -
c+	C Y CL -	C Y F -	C N F M	C Y CS -	C N MA M	C Y AO -
c-	F Y CS -	F N DT M	N N GU -	F Y CS -	N ? ? -	N Y #F -

132	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA -	F N F M	F Y UN -	N Y #F -	N Y #F -	N Y HU -
b-	N Y #F -	N Y HU -	F Y F -	N Y #F -	N Y UN -	N Y #F -
c+	C Y CA -	N Y HU -	N Y DF -	N Y #F -	N Y UG -	N Y #F -
c-	N Y CS -	N Y #F -	N Y #F -	N N CS M	N Y GU -	N Y UN -

133	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y AO -
b-	F Y CA -	F N F F	F Y F -	F Y CA -	F ? ? -	F N AO M
c+	C Y CA -	C Y F -	C N OP O	C Y CA -	C N GU -	C Y UN -
c-	F Y CS -	N N GI GI	N N GI GI	F Y CL -	N N GI GI	N N GI GI

134	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y UN -	N N GU -	C N GI GI	N Y UN -	N N UN -	N N UN -
b-						
c+						
c-						

135	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N OP O	C Y #F -
b-	N Y #F -	F Y F	F N F M	N Y #F -	F N OP O	N Y #F -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N OP O	C N AO M
c-	F Y S -	F N CI GI	F Y F -	C Y S -	F N OP O	F N GU -

136	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS -	C Y F -	N Y F -	C Y CS -	C Y F -	F N OP O
b-	F Y CL -	F N F F	N N GI GI	N Y CS -	N N UN -	F N OP O
c+						
c-						

137	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL -	C Y F -	C Y AO -	C Y CS -	C N GI GI	C Y AO -
b-	F Y CL -	N Y DT -	N Y UN -	N Y CL -	N N GI GI	N Y UO -
c+	C Y CL -	C Y F -	C N F F	C Y CL -	C N UN -	C Y AO -
c-	N Y #F -	N Y DF -	N Y DF -	N Y CL -	N N GI GI	N N UG M

139	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GU -	F Y F -	F Y F -	F Y S -	C Y MA -	N Y AO -
b-	F Y S -	F Y F -	F Y F -	F Y S -	F Y MA -	F Y AO -
c+	F N CS M	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	F N CA M	F Y F -	F Y F -	F N CA M	F N UG M	F Y F -

140	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N GU -	N Y #F -
b-	N Y #F	F Y F -	N Y #F -	N Y #F -	N N GI GI	N Y #F -
c+	N Y [illegible] -	N N UN -	N N UN -	[illegible] Y CS -	N N GI GI	N Y UG -
c-	N Y [illegible] -	N Y UG -	N Y DF -	N Y CS -	N N GI GI	N Y UG -

141	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N N DF M	N N DF M	N Y #F –	N N #F –	N Y UG –
b–	N Y #F –	N Y #F –	N Y UN –	N Y #F –	N Y UN –	
c+	N Y #F –	N Y DF –	N Y DF –	N N CA M	N Y UG –	N Y UG –
c–	N Y CL –	N Y #F –	N N GU –	N Y CS –	N N UG M	N N UG M

142	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C N OP O	C N OP O	C Y CA –	C N OP O	C N OP O
b–	F Y CS –	F N OP O	F N OP M	F Y CA –	F N GI GI	F N OP O
c+						
c–						

143	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	C N F M	N Y #F –	C N MA M	N Y UG –
b–	O Y S –	C Y F –	O Y F –	F Y S –	F Y MA –	F Y AO –
c+	C Y CL –	C Y F –	C Y F –	C Y CL –	C Y MA –	C Y AO –
c–	F Y S –	O Y F –	O Y F –	O Y CS –	– ? ? –	F Y AO –

144	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F N GU –	F Y F –	C Y AO –	N Y CL –	F Y F –	N Y UG –
b–	N Y #F –	F Y F –	F Y UN –	N Y #F –	F N F M	N Y #F –
c+	F Y CS –	F Y F –	N Y UN –	N N GU –	N Y UN –	N Y #F –
c–	F Y CA –	F Y F –	F N F M	N N HU –	F Y F –	N N GU –

145	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N MA M	C Y AO –
b–	F Y CA –	F Y F –	F N OP O	F Y CA –	F Y MA –	F Y AO –
c+	C Y CA –	C Y F –	C N OP O	C Y CA –	C Y MA –	C Y AO –
c–	F Y CA –	F Y F –	N N GU –	F Y CA –	N N UN –	F Y UG –

149	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S –	C Y F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
b–	N Y #F –	N N GU –	N Y #F –	N Y CL –	N Y #F –	N Y #F –
c+	N Y CL –	C Y F –	C Y F –	C N CA M	C Y F –	C Y AO –
c–	F Y CL –	F Y UG –	N N UG F	N Y CL –	N N HU M	N N HU F

150	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y #F –	C N GI GI	C N GI GI
b–	F N CS M	F N F F	F Y F –	F Y CS –	F N GI GI	F Y AO –
c+	C Y CL –	C N F M	C Y F –	C Y CS –	C N GI GI	C Y AO –
c–	N N CS –	F N F M	F N F M	F Y CS –	N N GI GI	F N AO M

151	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA –	F Y F –	F Y F –	F Y CA –	F N OP O	F N OP O
b–	F Y CS –	F Y F –	F N GI GI	F N CS M	F N OP O	F N OP O
c+	C Y CA –	C N F F	C N GU –	C Y CA –	N N GU –	N N GU –
c–						

152	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS -	C Y F -	C Y F -	C Y #F -	N Y UN -	C Y AO -
b-	F Y CS -	F Y F -	F Y F -	F Y CS -	F Y AO -	F N AC M
c+	C Y CL -	C N F M	C Y F -	C Y CL -	C Y MA -	C Y AO -
c-	F Y CS -	F N F M	F N F M	F Y CS -	F ? ? -	F Y AO -

153	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
b-	N Y CS -	N Y DF -	F N F M	N Y #F -	N Y UG -	N Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	F N CS M	N Y GU -	N N GU -	F N CS M	N N UG M	N N UG M

154	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C Y F -	C N GI GI	C Y CL -	C Y MA -	N Y #F -
b-	N Y UN -	N Y #F -	N N GI GI	N Y #F -	N N GU -	N Y #F -
c+	C Y CA -	C Y F -	C N GI GI	C Y CA -	C Y F -	C N AO M
c-	N Y #F -	[illegible] #F -	N N GU -	N Y CL -	N N GU -	N Y UG -

155	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N N GU M	N Y F -	N Y #F -	N Y UN -	N Y #F -
b-	N Y #F -	N Y F -	N Y F -	N N CS M	N Y UG -	N Y #F -
c+	N Y CS -	N Y DF -	N Y DF -	N Y CL -	C [illegible] AO -	C Y AO -
c-	N N CL M	N N DF M	N Y DF -	N Y CS -	N Y UG -	N Y UG -

157	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GU -	N N GI GI	N N GU -			
b-						
c+						
c-						

158	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y HU -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CS -	F Y UN -	F Y AO -
c+	C Y CS -	C Y F -	C Y F -	C Y CL -	C Y MA -	C Y AO -
c-	F Y CL -	N Y UN -	N N UN -	N Y CL -	N Y UN -	N Y UN -

159	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	F N F M	F Y AO -	N Y HU -	N Y #F -	N Y UG -
b-	N Y #F -	N N DF M	N N UG M	N Y CL -	F Y UG -	F Y UG -
c+	F N CL M	F N DF M	F Y UG -	F Y CL -	F Y UG -	F N UG M
c-	F N CL M	F ? ? -	F Y UG -	F Y CL -	N N GU -	F Y UG -

160	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N N DF M	N N UN -	N Y CL -	N Y UG -	N Y #F -
b-	N Y #F -	N Y DF -	N Y DF -	N Y #F -	N Y UG -	N N UG M
c+	N Y CL -	N N DF M	N Y HU -	N N CL M	N N UN -	N Y UG -
c-	N Y CS -	N Y DF -	N N DF M	N N CL M	N N UG M	N N UG M

161	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	N N GI GI	F N AO M
b-	F Y CA -	O Y F -	F N GI GI	O N CA M	O N GI GI	F Y UN -
c+	C Y CA -	C N F M	C N F M	C N CA M	C N MA M	C Y AO -
c-						

162	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y HU -	N Y #F -	N Y CL -	N Y #F -	N Y UG -
b-	N Y #F -	F Y DF -	F Y UG -	F Y #F -	F Y UG -	F Y #F -
c+	N Y HU -	C Y F -	N Y HU -	C Y CA -	C Y AO -	N Y HU -
c-	N Y #F -	N N GU -	N Y #F -	N N GU -	N N GU -	F Y UG -

163	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
c+	N Y #F -	N Y #F -	N Y #F -	N N GU -	N Y #F -	N Y #F -
c-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

164	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CL -	C Y F -	C Y #F -	N Y CL -	N Y #F -	C Y AO -
b-	N Y #F -	N Y #F -	N Y #F -	N Y CL -	N Y GU -	F Y UG -
c+	C Y CS -	C Y F -	C Y F -	N Y CL -	C Y MA -	F Y UG -
c-	N Y CL -	N Y HU -	N N UN -	N Y CS -	N N UN -	N Y UG -

165	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	C ? ? –	C N OP O
b–	F Y CS –	F Y F –	– ? ? –	F Y S –	F N OP O	F N OP M
c+	C N CA M	C N F M	C Y F –	C Y CA –	C ? ? –	C N OP F
c–	F Y CA –	F N DF M	F N DF M	F N UN –	N N GI GI	F Y UG –

166	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	N Y #F –	C Y F –	C Y S –	C Y MA –	C Y AO –
b–	F Y #F –	F Y F –	F Y F –	N Y #F –	N N HU F	N Y UG –
c+	C Y CA –	C Y F –	C Y F –	C N CA M	C Y MA –	C Y AO –
c–	N Y CL –	N GI GI	F Y F –	F N CA M	F N UN –	F N AO M

167	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CA –	C Y F –	C Y F –	N Y HU –	C Y F –	N Y UG –
b–	N Y #F –	N N HU –	F Y F –	N Y #F –	N Y DT –	N Y UG –
c+	N N CL M	C N F M	C N F F	N Y CL –	C N MA M	
c–						

168	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N N DF M	N Y #F –	N Y #F –	N N OP O	N Y UG –
b–	N Y #F –	N Y #F –	N Y HU –	N Y #F –	N N OP O	N N OP O
c+	N Y CL –	N Y UG –	N N UG F	N Y CL –	N N OP F	N Y UG –
c–	N Y CL –	N Y DF –	N N DF M	N Y HU –	N N OP F	N Y UG –

169	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CL -	C Y F -	C Y F -	C Y #F -	C N OP O	C Y AO -
b-	N Y #F -	F Y F -	F N GI GI	F Y CL -	F N OP O	N Y UG -
c+	C Y CS -	C Y F -	C Y F -	C Y CL -	C N OP O	C N AO M
c-	F Y CL -	F Y F -	F Y F -	F Y CL -	F N OP O	F Y UG -

171	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y HU -	C N F M	N Y CL -	N Y DF -	N Y UG -
b-	N Y CL -	F N UN -	F Y F -	N Y CL -	N Y DF -	N Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y AO -
c-	N Y CL -	F Y F -	F Y F -	N Y CL -	N N UG F	N ? ? -

172	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
b-	N Y HU -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
c+	N Y HU -	F Y UG -	N Y UG -	N Y #F -	N Y UG -	N Y UG -
c-	F Y CS -	N Y #F -	N Y #F -	F Y CL -	F Y UG -	F Y UG -

173	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S -	C Y #F -	C . AO -	C Y S -	C Y MA -	C Y #F -
b-	N Y #F -	F Y F -	N Y #F -	N Y #F -	N Y #F -	N Y HU -
c+	N Y CL -	N Y DF -	N Y DF -	C Y CA -	C Y MA -	C Y AO -
c-	N Y UN -	N Y DF -	N Y DF -	F Y S -	N N UG F	N Y UG -

175	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	C Y F -	N Y #F -	N N GI GI	N Y #F -
b-	N Y #F -	N Y #F -	N N DF M	N Y #F -	N Y UG -	N Y #F -
c+	N Y #F -	N Y DF -	N Y DF -	N Y HU -	N Y UG -	N Y #F -
c-	N Y #F -	N Y DF -	N N DF M	N Y #F -	N Y #F -	N Y #F -

176	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	N Y #F -	C Y F -	C Y #F -	C Y #F -	N Y #F -
b-	N Y #F -	N Y #F -	C Y F -	N Y #F -	N Y #F -	N Y #F -
c+	C Y CA -	C N F M	C N F M	C Y CL -	C Y MA -	C Y AO -
c-	F Y CL -	F Y UG -	F Y UG -	F Y CL -	F Y UG -	N Y UG -

177	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA M	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
b-	N Y CL -	F Y F -	F Y F -	N Y #F -	F Y UN -	N Y #F -
c+	C Y CA -	C N F M	C Y F -	C Y CA -	C N MA M	C Y AO -
c-	N Y CL -	F Y F -	F N F M	N Y CL -	F Y F -	F Y AO -

203	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y DF -	N Y DF -	N Y CL -	N Y DF -	N Y UG -
b-	N Y CL -	N Y DF -	N Y #F -	N Y CL -	N Y DF -	N Y #F -
c+	F Y CL -	C Y F -	C Y F -	F Y CL -	C Y F -	F Y UG -
c-	F Y CS -	N Y HU -	F Y DT -	F Y CL -	F Y DT -	F Y UG -

205	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y HU –	N Y #F –	N N GI GI	N Y #F –
b–	N Y #F –	N Y UN –	N Y UN –	N Y #F –	N N GI GI	N Y UN –
c+	N Y CL –	N N HU –	N Y #F –	N Y #F –	N N GI GI	N Y UN –
c–	N Y CL –	N Y UG –	N N U[illegible] F	N N UN –	N N GI GI	N N UN F

206	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	C Y F –	C Y F –	N Y UN –	N Y UN –	N Y #F –
b–	N Y #F –	N Y #F –	N ? ? –	N Y #F –	N Y UG –	N N UG F
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y F –	C Y AO –
c–	F Y UN –	F N UN –	– ? ? –	F Y CL –	F Y UG –	F Y UG –

207	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S –	C Y F –	C Y F –	C N CA M	N Y #F –	N Y #F –
b–	F Y CS –	F Y F –	F Y F –	N Y #F –	N Y UG –	F Y UG –
c+	C Y CA –	C Y F –	C N F M	C Y CA –	C Y F –	C Y AO –
c–	F Y CS –	F Y DF –	F Y F –	F Y CL –	F Y AO –	F Y AO –

208	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y #F –	C Y F –	N Y #F –	N Y UN –	C Y MA –	C Y AO –
b–	F Y CL –	F Y F –	N Y UG –	N Y UN –	N Y #F –	N Y #F –
c+	C N UN –	C N UN –	C Y F –	F Y CL –	C Y MA –	C Y AO –
c–	F Y CS –	F Y F –	F Y DF –	F Y CS –	N Y UN –	N Y HU –

210	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
b–	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y UG –	N Y #F –
c+	N Y #F –	N Y UG –	N Y UG –	N Y #F –	N Y HU –	N Y UG –
c–	N Y HU –	N Y HU –	N Y HU –	N Y #F –	N Y HU –	N Y #F –
211	**Task 1**	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**
b+	C Y CA –	C Y F –	C N GI GI	C N GI GI	N N GI GI	C N AO –
b–	F Y CA –	F Y F –	F N GI GI	F Y CA –	N N GI GI	F Y AO –
c+	C N CA M	C Y F –	C N UN F	C Y CA –	C N GI GI	C N AO M
c–	F N CA M	N N GU –	N N GU –	F N CA M	N N GI GI	N N GU –
213	**Task 1**	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**
b+	C N CA M	C Y F –	C Y F –	C Y CA –	C Y MA –	C N F M
b–	F Y CA –	F Y F –	F Y F –	F Y CA –	F N OP O	F N GI GI
c+	C Y CA –	C Y F –	C N MA M	C Y CA –	C N MA M	C N OP O
c–	F N GU –	F N F M	N N GU –	N N GU –	N N GU –	N N GI GI
215	**Task 1**	**Task 2**	**Task 3**	**Task 4**	**Task 5**	**Task 6**
b+	C Y CA –	C Y F –	C Y F –	C Y CS –	C N GI GI	C Y AO –
b–	F Y CA –	F Y F –	N Y UN –	F Y S –	N N GI GI	N Y UN –
c+	C Y CL –	C Y F –	C Y F –	C Y CA –	N N GI GI	C Y AO –
c–	F N CA M	F Y F –	F N F M	F Y CA –	N N GI GI	F Y AO –

217	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y UN –	C Y F –	C Y F –	C Y CA –	N N GI GI	N U UG –
b–	F Y S –	F Y F –	F Y F –	F Y S –	N N GI GI	F Y AO –
c+	C Y CA –	F Y F –	C Y F –	C N CA M	N N GI GI	C N AO M
c–	F ? ? –	F N UN –	F N UN –			

218	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	C Y F –	C Y F –	N Y CL –	C Y MA –	N Y UG –
b–	N Y CL –	N Y UG –	F Y F –	N Y CL –	N N MA F	N Y UG –
c+	N Y CL –	C Y F –	C Y F –	N Y CL –	C N MA M	C Y AO –
c–	N Y CL –	N ? ? –	N N UN –	N Y CL –	N Y UN –	F N UG M

220	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y UN –	N Y UN –	N Y #F –	N N GI GI	N Y UC –
b–	N Y #F –	N Y #F –	N Y UG –	N Y #F –	N Y #F –	N Y UG –
c+	N Y CL –	C Y F –	C Y F –	C Y CA –	C Y F –	F Y #F –
c–	N Y CL –	N Y #F –	N Y UN –	N Y CS –	F Y UG –	F Y UG –

222	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y HU –	N Y #F –	N Y #F –	N Y HU –	N Y #F –
b–	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	N Y #F –	N Y HU –	C Y F –	N Y HU –	N N UG M	N Y HU –
c–	N Y HU –	N Y HU –	N N HU –	N Y HU –	N Y HU –	F Y UG –

223	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y UN –	F Y F –	N Y #F –	N Y HU –	N Y #F –
b-	N Y HU –	N Y DF –	N Y #F –	N Y #F –	N Y #F –	F Y UG –
c+	C Y #F –	F Y UG –	F Y UG –	N Y HU –	N Y UN –	C Y HU –
c-	N Y HU –	N Y HU –	N Y UN –	N Y CL –	N Y HU –	F Y UG –

224	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
b-	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	N Y #F –	N Y #F –	N Y #F –	N N GU F	F Y AO –	N Y #F –
c-	N N GU –	N Y #F	N N GU –	F Y CL –	N Y #F –	N Y #F –

225	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N UN –	N Y #F –	N N GI GI	N N #F –	N Y #F –	N Y #F –
b-	N N CL M	N Y #F –	N N GI GI	N Y #F –	N N OP O	N Y #F –
c+	N Y #F –	C Y F –	C Y F –	N Y CL –	C N MA M	C Y MA –
c-	F N CL M	F Y F –	N ? ? –	N Y CL –	N N GU –	N N GU –

226	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N GI GI	C Y AO –
b-	N Y #F –	N Y #F –	N N OP O	F Y CA –	N N GI GI	N Y UN –
c+	C Y CA –	C Y F –	C N F M	C Y CA –	N N GI GI	C Y AO –
c-	F N UN –	F N F –	F N F –	F N CA M	F N GI GI	F N AO M

227	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y HU –	C Y F –	C Y F –	N Y CL –	C N OP O	C Y F –
b-	F Y CA –	F Y F –	N Y #F –	N N CL M	F N GI GI	F Y AO –
c+	N Y CL –	C N F M	C N F M	C N CA M	N N GI GI	C M UN M
c-						

229	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C N CA M	C Y F –	N N GI GI	C Y CA –	C Y UN –	F Y AO –
b-	F Y CA –	F N F F	F N GI GI	F N UN –	F Y AO –	F Y AO –
c+	C N CA M	C N F M	C N F M	C Y CA –	C Y F –	C Y AO –
c-	F N CA F	F N F M	F N GI GI	F Y CA –	N Y UN –	F Y DT –

230	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	C Y F –	C Y F –	N Y #F –	C Y F –	C Y AO –
b-	N Y #F –	F Y F –	F Y F –	F Y CA –	F Y UN –	N Y UG –
c+	C Y CA –	C Y F –	C N F M	C Y CA –	– ? ? –	C Y HU –
c-	F N CA M	F N F M	– ? ? –	F Y CA –	– ? ? –	– ? ? –

231	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	F Y DF –	F Y AO –	N Y #F –	F Y AO –	F Y UG –
b-	N Y #F –	N N UN F	N N UN –	N Y #F –	F Y UN –	F Y #F –
c+	F Y CL –	F Y DT –	F Y AO –	F Y CS –	F Y AO –	F Y AO –
c-	F Y CL –	N Y UN –	F Y AO –	N Y UN –	F Y AO –	F Y AO –

235	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y S -	C Y MA -	C Y AO -
b-	N Y #F -	N Y UN -	N N UN F	N Y CS -	F N UG M	N Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	N Y UN -	F Y F -	F N GU -	F Y UN -	F ? ? -	N Y UN -

236	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
b-	F Y CL -	F Y DF -	F Y DF -	F Y CS -	F Y AO -	F Y #F -
c+	C Y CA -	C Y F -	F Y F -	C Y CA -	C Y MA -	C Y AO -
c-	N Y #F -	N Y DT -	N Y DF -	N N CL M	- ? ? -	N Y UG -

237	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CL -	F Y F -	N Y UG -	F Y CS -	N N UG M	F Y UG -
b-	F Y CL -	F Y F -	F Y F -	F Y CS -	F Y AO -	F Y AO -
c+	F N CL M	C Y F -	F Y DF -	N Y CL -	N N DF M	F Y AO -
c-	F Y CL -	F Y F -	F N F M	F Y CL -	F Y UG -	F Y UG -

238	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N N UN -	F N CL M	N Y UN -	N Y #F -
b-	N Y #F -	N N UN -	N N UN -	N Y #F -	N N UN -	N Y UN -
c+	F Y CA -	N N GU -	N N GU -	F Y CA -	N GU -	N Y UN -
c-						

240	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N N GU -	N N GU -	N Y UN -	N Y #F -
b-	N Y #F -	N Y #F -	N N GU -	N Y CS -	N N GU -	N Y UG -
c+	F Y UN -	N N UN -	N Y #F -	N N CL M	N Y UN -	F Y UG -
c-	N Y UN -	F N F -	F ? ? -	N Y CL -	N Y UG -	N Y #F -

241	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N GI GI	C Y AO -
b-	F Y UN -	F Y F -	F Y F -	F Y CA -	F N UN F	F Y AO -
c+	C Y CA -	C N F M	C Y F	C Y CA -	C N GI GI	C Y F -
c-	F N GU -	F N UN -	F N UN -	F N GI GI		

242	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y AO -
b-	N Y CS -	N Y #F -	N N UN F	F Y CS -	N N UN -	N Y UG -
c+	C Y CA -	C Y F -	C N F M	C N CA M	C N F M	C Y AO -
c-	N N CS M	N N GI GI	N N GU -	F N CS M	N N GU -	N Y UG -

244	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	N N UN -	C Y F -	N Y CL -	N Y UN -	C Y AO -
b-	N Y CA -	F Y F -	N Y UN -	N Y CA -	F Y F -	F Y UN -
c+	C Y CA -	N Y UN -	F Y AO -	F Y CA -	C Y MA -	F Y AO -
c-	N N CL F	N Y DF -	N Y DF -	F Y CS -	N Y UG -	N Y UG -

246	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	N Y UN –	N N GI GI	N N GI GI	N Y UN –	N Y UN –
b–	N Y UN –	N Y UN –	N N GI GI	N Y UN –	N N UN –	N N UN –
c+	F Y CL –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y MA –
c–	N Y UN –	– ? ? –	– ? ? –	– ? ? –	– ? ? –	– ? ? –

247	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GU –	N Y DF –	N Y UN –	N Y CS –	N Y UN –	N Y UG –
b–	N Y CS –	N Y DF –	N Y UN –	N Y CS –	N Y UG –	N Y UG –
c+	N Y CS –	N N DF F	N N DF –	N Y CL –	– ? ? –	N Y UN –
c–	N Y CS –	N N UN –	N Y UN –	N Y CS –	N N UN –	N N GU –

249	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C N UN –	C Y CA –	C Y MA –	C Y AO –
b–	F Y CA –	F N UN –	F Y UN –	F Y CA –	F N GU –	N Y #F –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N MA M	C N AO M
c–	F Y CA –	F N UG M	F UG M	F N GI GI	F N UG M	F Y UG –

251	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL –	N Y #F –	N Y #F –	N Y CL –	N Y UG –	N Y #F –
b–	N Y CL –	N Y UG –	N Y #F –	N Y CL –	N N UG F	N Y UG –
c+	N Y CL –	N Y DF –	N Y UG –	C Y CA –	F Y UN –	N N UG M
c–	N Y #F –	N Y UN –	F Y UG –	N Y UN –	N Y UN –	N N UN –

252	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S -	C Y F -	C Y F -	C Y CA -	N Y #F -	N Y #F -
b-	N Y CL -	N N GU -	N N GU -	N N GU -	N Y #F -	F Y AO -
c+	C Y CA -	C N F M	C N F M	C Y CA -	C N AO M	C N AO M
c-	F N CS M	F ? ? -	F N AO M	F N CS M	F N AO M	F N AO M

253	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N N UN -	N N GI GI	C Y CA -	C N OP O	C Y AO -
b-	F N UN -	N N UN -	N N GU -			
c+						
c-						

254	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y UN -	C Y AO -
b-	F Y CA -	F Y F -	F Y UN -	F Y CA -	F Y UN -	F Y #F -
c+	C Y CA -	C Y F -	C Y F -	C Y CL -	C Y F -	C Y AO -
c-	F Y CL -	F N AO -	F Y UN -	F Y CL -	F Y AO -	F Y AO -

256	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y UN -	C N OP O	N N #F F	N N GU F	N Y #F -
b-	N Y #F -	F N AO M	F N OP O	N Y #F -	N N GI GI	N Y UG -
c+	C N CA M	C N GI GI	C N GI GI	C Y CA -	N N GI GI	C Y AO -
c-	F Y UN -	F N UN -	N N GI GI	N N CL M	N N GI GI	F Y AO -

258	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y #F -
b-	N Y CL -	N Y #F -	N Y UG -	N Y #F -	N Y UG -	N Y UG -
c+	C Y CS -	C Y F -	C Y F -	C Y CS -	C Y MA -	C Y AO -
c-	F Y CS -	F N F M	F N F M	F Y CL -	- ? ? -	F Y AO -

260	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y HU -	C N F F	C Y F -	C Y CA -	C Y MA -	N N HU -
b-	N Y #F -	F Y F -	F Y F -	F Y S -	F Y F -	N Y #F -
c+	C Y CS -	C Y F -	F Y UG -	C Y CS -	F Y UG -	F Y UG -
c-	F N CA M	F N DF -	F Y UG -	F N CS M	F Y UG -	F N UG F

261	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N GI GI	C Y F -	C Y F -	C Y CA -	C Y F -	C Y AO -
b-	F N CS M	F Y F -	F Y F -	F Y CA -	F Y AO -	F Y AO -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y AO -
c-	F Y CS -	- ? ? -	- ? ? -	F Y CS -	- ? ? -	F Y UG -

262	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	N Y DF -	C Y F -	N Y #F -	F Y AO -	C Y AO -
b	N Y #F -	F Y F -	F Y F -	N Y UN -	F Y AO -	N Y #F -
c+	C N CA M	C Y F -	C Y F -	F Y CS -	C N F M	C Y AO -
c-	N Y UN -	F ? ? -	N N UN -	F N CA M	N N GI GI	N N UG M

264	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y DF -	N Y UN -	N Y CL -	N Y UG -	N Y #F -
b-	N Y #F -	N Y DT -	N Y #F -	N Y #F -	N Y UG -	N Y UG -
c+	N Y CL -	C Y F -	N Y UG -	N Y #F -	N Y UG -	C Y UG -
c-	N N CL F	F N DF M	F Y UG -	N Y CL -	Y UG -	N Y UG -

266	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	F Y DF -	N N GI GI	N Y CL -	F Y UG -	N Y #F -
b-	N Y CL -	F Y DF -	N N GI GI	N Y CL -	N Y UG -	N Y UG -
c+	F N CL M	F Y DF -	N N GI GI	F Y CL -	F Y UG -	F Y UG -
c-	N N #F F	F Y DF -	N N GI GI	F Y CL -	F Y UG -	F Y UG -

267	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y .. -	N Y #F -	N Y HU -	N N #F F	N Y HU -	N Y #F -
b-	N Y #F -	N Y #F -	N Y UG -	N Y #F -	N Y UG -	N Y #F -
c+	N Y #F -	N N UN -	N N . -	N Y HU -	N N HU M	N N HU M
c-	N Y #F -	N N HU M	N Y HU -	N N GU -	N Y HU -	N N HU M

268	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y F -	C Y UG -
b-	F Y CA -	F Y F -	F Y F -	F Y CA -	F Y #F -	F Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	F Y F -	F N UN F
c-	F Y CA -	F Y F -	F Y F -	F Y CA -	N Y UN -	F Y AO -

269	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL -	C Y F -	C Y AO -	C Y CL -	C Y MA -	C Y UN -
b-	N Y CS -	F Y UG -	N Y #F -	N Y CS -	N Y UG -	N Y UG -
c+	C Y CA -	C Y UG -	F Y UG -	F Y CL -	C Y MA -	C Y UG -
c-	F Y CL -	F Y UG -	F Y UG -	F Y CL -	F Y UG -	F Y UG -

270	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CA -	F Y F -	F Y F -	F Y CA -	F N F M	F Y AO -
b-	F Y CA -	F Y F -	F Y F -	F Y CA -	F N GI GI	F Y AO -
c+	C N CA M	C N F M	C Y F -	C Y CA -	C N F M	C Y AO -
c-	F Y CS -	N N UN -	N Y UN -	N Y CL -	N N UN -	N Y UG -

271	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F -	F Y F -	C Y F -	C Y CA -	C N GI GI	C Y AO -
b-	N Y #F -	N Y UN -	N Y UN -	N Y #F -	N N GI GI	N Y #F -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C N UN -	C Y AO -
c-	N Y UN -	N N UN -	N N UN -	F Y CL -	N N GI GI	F Y UG -

301	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y UN -	C Y F -	N Y UN -	C Y CA -	C Y UN -	C Y UG -
b-	N Y UN -	F Y F -	F Y F -	N Y UN -	N Y UN -	N Y UN -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y UN -	N Y UN -
c-	F N UN -	- ? ? -	- ? ? -	- ? ? -	- ? ? -	- ? ? -

302	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	F N UN -	N Y #F -	N Y #F -
b-	N N UN -	N Y #F -	N Y #F -	F Y S -	N Y #F -	N Y #F -
c+	C Y CL -	C Y F -	C Y F -	C Y CL -	C Y MA -	C Y MA -
c-	F Y CS -	F Y [illegible]	N Y UG -	F Y CS -	F Y UG -	F Y UG -

303	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -
c+	N Y #F -	N Y HU -	N Y HU -	N Y #F -	F Y DF -	N Y #F -
c-	N Y #F -	N N #F -	N Y #F -	N Y #F -	N Y #F -	N Y #F -

304	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
b-	N Y #F -	F Y F -	F Y F -	F Y CA -	F Y AO -	F Y AO -
c+	C Y CA -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
c-	F Y CL -	F N F M	N N GU -	N N UN -	F Y UG -	F Y AO -

305	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y UG -	N Y CL -	N Y UN -	N Y UG -
b-	N Y CS -	N Y DF -	N Y UN -	N Y UN -	N Y UG -	N Y HU -
c+	N Y UN -	N Y UG -	C Y UG -	N Y CL -	N Y HU -	N Y UG -
c-	N Y CL -	N Y UG -	N Y UG -	N Y CL -	N Y UG -	N N UG M

306	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C N F F	C Y CA -	C N GI GI	C N OP M
b-	F Y CA -	F Y UN -	F N UN -	F Y CS -	F N OP O	F N OP O
c+	C N CA M	C Y F -	C N F M	C N UN -	C N UN -	C N GI GI
c-	N Y #F -	F N F M	F N UN -	- ? ? -	N N GI GI	F N UN -
307	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	C Y F -	N Y #F -	N Y #F -	C Y F -	N Y #F -
b-	N Y #F -	N Y UG -	N Y UN -	N Y #F -	N Y #F -	N Y #F -
c+	C Y CA -	N Y DF -	N Y HU -	N Y CL -	N Y UG -	C Y AO -
c-	N Y #F -	- ? ? -	N Y #F -	N Y CL -	N N UN M	F Y UG -
308	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CL -	N Y UN -	N Y UG -	N Y UN -	C Y MA -	N Y UG -
b-	N Y #F -	N Y UG -	N N UN -	N Y UN -	N Y UN -	N Y UN -
c+	N Y CL -	C N F M	N Y UN -	F Y CL -	N N GU -	C Y AO -
c-	F N CL M	N Y #F -	N Y UN -	N N UN -	N N GI GI	N N UN -
309	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y S -	C Y F -	C Y F -	C Y CA -	C Y MA -	C Y AO -
b-	N N UN -	N Y #F -	N N UN -	N N UN -	N Y UN -	N Y UG -
c+	C N CA M	C Y F -	C Y GU -	C Y CA -	C N MA F	C N UN -
c-	N Y UN -	N Y #F -	N N GU -	N N CS M	N N GU -	N N UG -

310	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y F -	N Y CL -	N N UN -	C Y AO -
b-	F Y CS -	F Y F -	F Y F -	F N UN -	N Y UG -	F Y UN -
c+	C Y CA -	C N F M	C Y F -	C Y CA -	C Y MA -	C Y F -
c-	F Y CL -	F N DF M	F Y F -	F N CS M	F Y AO -	F Y UG -

311	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA -	C Y F -	C Y UN -	C Y CL -	C Y MA -	C Y UN -
b-	N Y CL -	N Y #F -	N Y UG -	N Y #F -	N Y UG -	N Y UG -
c+	C Y CA -	C Y F -	C Y F -	C Y CS -	C N F M	C Y AO -
c-	N Y CL -	N N GU -	N Y GU -	N Y CL -	N N GU -	N Y UG -

312	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N Y UG -	N Y #F -
b-	N Y #F -	N Y #F -	N Y #F -	N Y #F -	N N #F F	N Y #F -
c+	N Y #F -	N Y HU -	N Y #F -	N Y #F -	N Y #F -	N N GU -
c-	N Y #F -	N N GU -	N N #F -	N Y GU F	N Y #F -	N N GU -

313	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CS -	C Y F -	C Y F -	C Y CA -	C Y AO -	N Y UG -
b-	N Y #F -	N Y UN -	N Y UG -	N Y CL -	N Y HU -	N Y UG -
c+	N Y CL -	N Y UG -	N Y UG -	N N CL -	C Y UG -	C Y UG -
c-	N Y CL -	N Y UG -	N Y UG -	N Y CL -	N Y UG -	N Y UG -

314	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
b–	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	N Y #F –	N N HU –	N Y HU –	N Y #F –	N N HU –	N N UN –
c–	N Y CL –	N Y HU –	N N HU –	N Y HU –	N N UN –	N N HU –

315	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CS –	F Y F –	F Y F –	F Y CA –	F Y MA –	F Y AO –
b–	F Y CA –	F Y F –	F Y F –	F Y CA –	F Y MA –	F Y AO –
c+	F Y CL –	F Y AO –	F Y AO –	F Y CL –	F Y AO –	F Y AO –
c–	F Y CS –	F Y AO –	F Y AO –	F Y CS –	F Y AO –	F Y AO –

316	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y UG –	N Y #F –	N Y UG –	N Y UG –
b–	N Y UN –	N Y F –	N Y #F –	N Y UN –	N Y UN –	N Y #F –
c+	C Y CS –	C Y F –	C Y F –	C Y CA –	C Y F –	C Y F –
c–	F N OP O	F ? ? –	F ? ? –	F Y CS –	F Y DT –	F Y UG –

317	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL –	N Y #F –	N Y #F –	N Y UN –	N Y #F –	N Y #F –
b–	N Y #F –	N Y #F –	N Y #F –	N N CL M	N Y UN –	N Y UN –
c+	N Y #F –	N Y #F –	N N GU –	N Y HU –	N Y HU –	F Y UG –
c–	F Y CS –	N Y UG –	N Y UG –	N Y CS –	F N UG M	N Y HU –

318	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	N Y UN –	N Y UN –	N Y #F –	N N UN –
b–	N Y #F –	N Y #F –	N Y #F –	N Y UN –	N Y UG –	N Y UG –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y UG –
c–	N Y CS –	N N DT –	F N UN –	F Y CA –	N N UN –	F Y UG –

319	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y F –	C Y AO –
b–	F Y CS –	F Y F –	F Y F –	F Y CS –	F Y F –	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C Y CS –	C Y MA –	C Y UG –
c–	F N CA M	F N DF M	F ? ? –	F Y CA –	F ? ? –	F Y UG –

320	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y UG –
b–	F Y CA –	F Y F –	F Y F –	F Y CA –	F Y F –	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y F –	C Y AO –
c–	N Y CL –	N ? ? –	N N UN –	N Y UN –	N ? ? –	N Y UG –

321	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F –	C Y F –	C Y F –	C Y CL –	N Y #F –	N Y #F –
b–	N Y #F –	F Y F –	N Y #F –	N Y CL –	N Y #F –	N Y UG –
c+	C Y CL –	C Y F –	C Y F –	C Y CL –	C Y MA –	C Y UG –
c–	N Y CL –	F N F M	F Y F –	N Y CL –	F Y UG –	N Y UN –

322	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL –	C Y F –	C Y F –	C Y CA –	C Y F –	C Y AO –
b–	F Y CS –	F Y F –	F Y F –	F Y CS –	F N UN –	F Y AO –
c+	C Y CL –	C Y F –	C Y F –	C Y CL –	C N MA M	C Y AO –
c–	F Y CA –	F N F –	F Y F –	F Y CL –	N N GU –	F Y AO –

323	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CL –	C Y F –	C Y F –	C Y CL –	C Y UN –	C Y AO –
b–	F Y CL –	F Y F –	F Y F –	F Y CS –	N Y #F –	N Y #F –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C Y MA –	C Y AO –
c–	F Y CS –	F N DF M	F N DF M	F N CS F	F Y UG –	F Y UG –

324	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y #F –	N Y #F –	N Y #F –	N Y #F –	C Y UN –	N Y #F –
b–	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	C N CA M	C Y F –	C Y #F –	N Y #F –	C Y MA –	N Y #F –
c–	N Y CL –	N Y #F –	N N UN –	N N CL M	– ? –	N Y UG –

325	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y CL –	N Y UN –	N N GU –	F Y CL –	N Y UG –	N Y UG –
b–	[illegible] Y CL –	F Y F –	N Y HU –	F Y CL –	N Y UN –	N Y UN –
c+	N Y CS –	F Y UG –	F N DF M	F [illegible] CS –	F Y UG –	F Y UG –
c–	F Y CS –	F Y DF –	F Y DF –	F Y CL –	[illegible] Y UG –	F Y UG –

326	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	F Y HU –	N Y DF –	N Y HU –	N Y CL –	N Y DF –	N Y UG –
b–	N Y CS –	F Y F –	N Y UN –	N Y CL –	N Y #F –	N Y UG –
c+	C Y CS –	C Y F –	C Y F –	C Y CL –	C N MA M	C Y AO –
c–	N Y CL –	F N DF M	N Y #F –	F Y CL –	N N GU –	F Y AO –

327	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y UN –	C N UN –	C Y S –	C Y F –	C Y UN –
b–	N Y #F –	N Y #F –	F Y F –	N Y CL –	F Y UG –	F Y UG –
c+	C Y CA –	C Y F –	C Y F –	C Y CL –	C Y MA –	C Y AO –
c–	F Y CL –	N Y DT –	F Y DT –	F Y CS –	F Y UN –	F Y UG –

328	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CS –	N Y DF –	N N GI GI	N Y CS –	N N UN –	N Y UG –
b–	F Y CS –	F N F M	N N UN –	N Y UN –	N N GI GI	N Y #F –
c+	C Y CA –	C N F M	N N GI GI	C Y CS –	C N MA F	C Y AO –
c–	N Y CL –	N N DF –	N N GI GI	N N GI GI	N N GU –	N N GU –

329	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y HU –	C Y F –	C Y CA –	C Y MA –	C Y AO –
b–	F Y CA –	F Y F –	F Y F –	F Y CA –	N Y HU –	F Y AO –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N MA M	C Y AO –
c–	F Y CA –	N N GU –	F Y F –	N N GU –	F Y UG –	F Y UG –

331	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
b–	N Y #F –	F Y UG –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y UN –	N Y #F –
c–	N Y #F –	N Y #F –	N Y #F –	N Y #F –	N Y UN –	N Y #F –

332	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N N UN F	N Y #F –	N Y #F –	N Y CL –	N Y UN –	C Y AO –
b–	N Y CL –	N Y UG –	N Y #F –	N Y #F –	N Y #F –	N Y #F –
c+	C Y CS –	C Y F –	C Y F –	C N CL M	N Y UG –	C Y AO –
c–	N Y CL –	N Y #F –	N Y UG –	N Y CL –	N N UN –	F Y UG –

333	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	C Y F –	C Y UN –	N Y #F –	N Y F –	C Y UG –
b–	F Y CA –	F Y F –	F Y F –	F Y UN –	N Y UG –	N Y #F –
c+	C Y CA –	C Y F –	C Y F –	C Y CL –	N Y UG –	N Y HU –
c–	N Y GI GI	N N DF –	F Y UG –	N Y CL –	N N UG M	N N GI GI

334	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y CS –	N Y DF –	N Y HU –	N Y CL –	N Y DF –	N Y #F –
b–	N Y #F –	N Y HU –	N Y #F –	N Y CL –	N Y UG –	N Y #F –
c+	N Y CL –	N Y HU –	N N UN –	C Y CA –	N Y UG –	N Y UG –
c–	F Y CA –	N N UN –	F ? ? –	N Y CL –	N Y UG –	N Y UG –

335	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	C Y CA –	N Y #F –	N Y UN –	C Y UN –	N Y UN –	N Y #F –
b–	N Y #F –	N Y UN –	N Y UN –	F Y S –	N Y UN –	N Y UN –
c+	C Y CA –	C Y F –	C Y F –	C Y CA –	C N F M	N N GU –
c–	N N CS M	F N F –	N N GU –	– ? ? –	N N GU –	N N GU F

336	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+	N Y HU –	N Y HU –	N Y UG –	N Y CL –	N Y UG –	N Y UG –
b–	N Y CL –	N Y DT –	N Y UG –	N Y CL –	N Y UG –	N Y UG –
c+	N Y CL –	N N GU –	N Y HU –	N N GU –	N Y HU –	N Y #F –
c–	N Y CL –	N N UG M	N Y #F –	N Y CL –	N Y UG –	N Y UG –

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+						
b–						
c+						
c–						

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6
b+						
b–						
c+						
c–						

APPENDIX C

NUMBER SET ASSIGNMENT FOR NUMBER TRIPLES

Number Set Assignment

student ID#

Level	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116
b+	3	2	3	2	4	2	6	2	4	2	4	4	6	3	1	5
b-	6	4	5	1	1	4	2	5	3	6	6	6	3	2	5	1
c+	2	4	5	6	5	4	2	1	3	4	3	3	4	1	5	1
c-	4	3	4	3	1	3	1	3	2	5	2	2	6	4	6	6

student ID#

Level	117	118	119	120	122	123	124	127	128	129	130	131	132	133	134	135
b+	6	1	5	5	6	6	1	3	6	2	2	4	4	5	6	5
b-	5	3	2	4	2	2	3	5	4	1	1	3	3	1	5	4
c+	5	6	6	4	2	2	6	5	2	6	6	3	3	1	5	4
c-	2	5	2	1	1	1	5	4	3	3	3	6	6	6	2	1

student ID#

Level	136	137	139	140	141	142	143	144	145	149	150	151	152	153	154	155
b+	1	3	5	1	4	5	5	1	4	4	3	1	1	6	3	6
b-	3	2	2	6	1	4	1	6	2	2	5	6	4	4	1	1
c+	6	1	6	2	5	4	1	2	3	3	5	2	3	2	1	1
c-	5	4	2	5	1	1	6	5	4	4	4	5	5	3	2	5

student ID#

Level	157	158	159	160	161	162	163	164	165	166	167	168	169	171	172	173
b+	3	4	2	3	6	1	5	2	5	1	3	6	1	3	3	6
b-	6	1	5	6	3	4	3	5	2	5	1	3	2	2	1	4
c+	2	5	1	2	4	3	6	1	6	5	4	4	6	1	4	2
c-	4	1	3	4	6	5	1	3	2	6	5	6	4	4	5	3

student ID#

Level	175	176	177	203	205	206	207	208	210	211	213	215	217	218	220	222
b+	3	2	1	3	2	2	6	4	2	3	2	2	5	1	3	5
b-	4	4	4	5	5	5		2	6	2	1	4	4	2	4	4
c+	5	4	3	5	1	1	5	3	1	1	6	4	4	6	5	4
c-	3	3	5	4	3	3	2	4	2	4	3	3	1	4	3	1

student ID#

Level	223	224	225	226	227	229	230	231	235	236	237	238	240	241	242	244
b+	6	5	3	4	5	5	4	6	4	5	4	3	3	6	1	5
b-	5	3	2	6	2	2	1	4	6	3	2	6	5	3	3	1
c+	5	6	1	3	6	6	5	2	3	6	3	2	5	4	6	1
c-	2	1	4	2	2	2	1	3	2	1	4	4	4	6	5	6

student ID#

Level	246	247	249	251	252	253	253	256	258	260	261	262	264	266	267	268
b+	2	2	3	1	6	6	4	5	6	6	1	4	3	1	3	1
b-	4	1	6	5	3	2	3	1	4	2	4	3	1	6	4	4
c+	4	6	2	5	4	2	3	1	2	2	3	3	4	2	5	3
c-	3	3	4	6	6	1	6	6	3	1	5	6	5	5	3	5

student ID#

Level	269	270	271	301	302	303	304	305	306	307	308	309	310	311	312	313
b+	1	1	4	4	1	2	1	5	6	6	5	3	4	2	6	4
b-	6	5	1	2	4	1	6	4	3	3	2	5	6	4	2	1
c+	2	5	5	3	3	6	2	4	4	4	6	5	3	4	2	5
c-	5	6	1	4	5	3	5	1	6	6	2	4	2	3	1	1

student ID#

	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329
b+	4	1	4	3	2	3	5	3	1	3	2	5	2	6	5	6
b-	3	3	1	6	5	5	1	2	3	2	5	2	4	5	1	5
c+	3	6	5	2	1	5	1	1	6	1	1	6	4	5	1	5
c-	6	5	1	4	3	4	6	4	5	4	3	2	3	2	6	2

student ID#

	331	332	333	334	335	336
b+	2	6	5	3	1	4
b-	1	2	4	6	4	6
c+	6	2	4	2	3	3
c-	3	1	1	4	5	2

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Reading and Communication

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Studies in Implementation
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